

THE
ELECTRIC ILLUMINATION
OF THE
BLADDER AND URETHRA

E. HURRY FENWICK

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ELECTRIC ILLUMINATION
OF THE
BLADDER AND URETHRA





Frontispiece.

CLAY MODEL OF LIVING BLADDER UNDER ELECTRIC LIGHT.



VILLOUS CARCINOMA OVERHANGING LEFT URETERAL ORIFICE.

THE
ELECTRIC ILLUMINATION
OF THE
BLADDER AND URETHRA
AS A MEANS OF
DIAGNOSIS OF OBSCURE VESICO-URETHRAL
DISEASES

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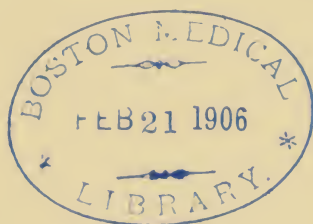
WITH FIFTY-FOUR ILLUSTRATIONS

SECOND EDITION



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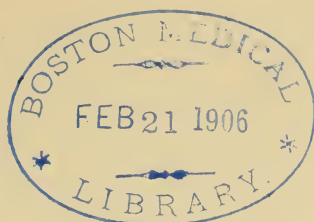
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TO

MY PROFESSIONAL
FRIENDS. .





PREFACE

TO THE

SECOND EDITION.

THE clinical part of this edition has been entirely re-written and much enlarged. I have endeavoured to embody in it my own experience of electric illumination of the bladder and urethra. Shortly before my manuscript went to press two able monographs upon Electric Cystoscopy appeared, one by Dr. Nitze,—the originator of the method,—the other by Professor Geza von Antal, of Buda-Pesth, and I regret that I have been in consequence unable to make use of such valuable material. As my opportunities for examining the bladder with electric light at St. Peter's Hospital for Urinary Diseases, at the London Hospital, and in private practice have been great, I have found some difficulty in selecting from my note-books those cases best suited to illustrate the text, and

for want of space, and to avoid the crime of tediousness I have been forced to omit several most interesting cases of vesical tumour, stone, and tuberculosis. My debt of gratitude to my professional friends for sending me cases of obscure vesico-urethral disease is a heavy one, and I gladly seize this opportunity of acknowledging it to some slight extent by dedicating to them this record of the work which we have done together. I have especially to thank Mr. D'Arcy Power for having carefully examined and reported upon the microscopy of those vesical tumours which I have removed. I am lastly, and by no means least, indebted to Mr. Leiter, of Vienna, for having so skilfully and so rapidly carried out my suggestions for improving the cystoscope.

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P R E F A C E

TO THE

F I R S T E D I T I O N .

THE following pages embrace the substance of two clinical lectures which I delivered at the commencement of this year at the London Hospital (January 27th) and at St. Peter's Hospital for Urinary Diseases (February 15th) upon the value of electric illumination of the bladder and urethra in the diagnosis of obscure vesico-urethral diseases (the Nitze method). I had previously demonstrated the construction of the instruments required for carrying out the examinations,—the Nitze incandescent-lamp cystoscope; the Leiter incandescent-lamp cystoscope; the Leiter incandescent-lamp urethroscope, and Schall's batteries, at a meeting of the Medical Society, January 23rd. I attempted in this way to draw attention to the great improvement which had taken place in the cumbersome

Nitze-Leiter instruments of 1879* by the substitution of an incandescent lamp for the platinum loop. From my experience of the *new* instruments I was convinced that we had arrived at an important epoch in the diagnosis and treatment of diseases of the bladder and urethra, which had, curiously enough, been completely overlooked in this country. The cystoscope of 1879 has the same relation to that of 1887 as the "Puffing Billy" of Stephenson to later locomotives; and though, doubtless, we have not reached its perfect completion, yet it is sufficiently practical to become an indispensable factor in the diagnosis of obscure diseases of the urinary tract. I have to cordially acknowledge the courtesy of Dr. Nitze (the able originator of the method) for permitting me to copy the cystoscopic pictures adorning his article on electric cystoscopy.† I have used them in my lectures, and have inserted three (Figs. 19, 22, 23‡) in the following pages. I am, moreover, much indebted to Mr. Leiter, of Vienna, for allowing me to use woodcuts from his 'Handbook

* Introduced into this country by Sir H. Thompson, 'Lancet,' 1880, April, p. 529.

† Dr. Nitze, "Beiträge zur Endoskopie," 'Langenbeck's Archiv,' vol. xxxvi, Heft 3.

‡ Figs. 28 and 31 in second edition.

of Electric Illumination '* to illustrate the construction of the instruments.

Bearing in mind the acrimonious dispute between Türk and Czermak over the laryngoscope, imitated by a somewhat similar and much-to-be deplored controversy between Dr. Nitze and Mr. Leiter concerning the cystoscope, I have avoided any participation in so needless a disagreement by quoting directly from the literature of the subject. The appearance of this work as a guide to electric cystoscopy and urethroscopy will be, I trust, condoned when it is realised that many volumes upon the ophthalmoscope, laryngoscope, and otoscope enrich the literature of these specialities ; but that with the exception of Dr. Nitze's article, none at present describe the use and the capabilities of electric light in affording us a direct visual diagnosis of diseases of the bladder and urethra without a cutting operation.

E. HURRY FENWICK.

April 10th, 1888.

* Josef Leiter, 'Elektro-endoskopische Instrumente,' 1880, Wien.



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PART I.

THE ELECTRIC ILLUMINATION OF
THE BLADDER.

ON ELECTRIC ENDOSCOPY.

CHAPTER I.

THE HISTORY OF VESICO-URETHRAL ENDOSCOPY.

It will be found on reference to the abundant literature of endoscopy that the history of its progress falls without effort into three distinct periods. The opening of each period is marked by a measurable advance upon the progress of its predecessor.

The first period commenced in 1805 with the invention by Dr. Bozzini,* of Frankfurt, of an apparatus which he termed the light conductor (*Lichtleiter*). Although the instrument was condemned by the Medical Faculty of Vienna on the ground of insufficient illumination, yet the idea

* Bozzini, "Lichtleiter, eine Erfindung zur anschauung innerer Theile und Krankheiten," 'Journ. d. prakt. Arznsk. u. Wund-arznsk.,' Berlin, 1806, xxiv, 107—124.

was grasped by the profession, and the method found many imitators. Thus, John Fisher, in 1824, completed an instrument which contained the principles upon which the Desormeaux endoscope of 1853 was constructed. Ségalas, to whom Desormeaux wrongly accords the merit of originating the principles of endoscopy, followed Fisher with a speculum urethrocysticum. Bombalini, John Avery, of London, Cazenave, of Paris, Gessler, Malherbe, Espezel, all added to the literature of the subject and attempted to improve the instruments for visual examination of the urethra and bladder.

The second period was opened in 1853 by Desormeaux,* “the father of endoscopy,” as Warwick has called him. Desormeaux laid the first practical endoscope before the Academy of Medicine at Paris, and his powerful and enthusiastic advocacy did much to favour the development of the science. Furstenheim made the endoscope popular in Germany. In 1865 Cruise,† of Dublin,

* ‘De l’Endoscope et de ses Applications au Diagnostic et au Traitement, &c.’ Par A. J. Desormeaux. Paris: J. B. Baillière et Fils, 1865.

† “The Endoscope as an Aid in the Diagnosis and Treatment of Disease.” By F. R. Cruise, M.D., Univ. Dub., &c. ‘Dublin Quarterly Journal of Medical Science,’ May 1st, 1865. Fannin and Co., Dublin.

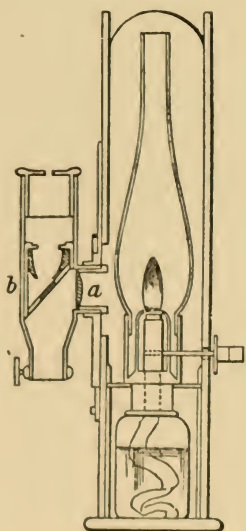
made an important improvement in Desormeaux's endoscope. This consisted in concentrating upon a reflector *the edge of a flat flame* of an ordinary petroleum lamp.

Camphor was mixed with the petroleum (gr. x ad 3j) to increase the brilliancy of the light, and an extra tall chimney was added to produce a steady flame. As this endoscope is typical of this period we shall describe it in Mr. Cruise's own words.

“ Fig. 1 shows it in sectional view. It consists of a lantern, in the interior of which the lamp is suspended by means of a diaphragm, which slides in grooves and holds it perfectly steady. The lamp is so placed when in the lantern that the *edge* of the flame is opposite the aperture of the tube, *a*. This tube rotates freely in the socket which receives it, and carries the condensing lens. It is attached at right angles to another tube, *b*, which, in the woodcut, for clearness' sake is represented in the vertical position. This latter tube holds the perforated mirror, and terminates at one end in a socket, which, by means of a thumb-screw, can be fitted to the various exploring specula; while at the other extremity is placed an eye-piece through which the observer looks. Although

represented in Fig. 1 in the vertical position in order to show a section of its interior, in use it is kept as nearly as possible horizontal, as delineated in Fig. 2. In order to protect the observer's eye from glare as much as possible, a conical dia-

FIG. 1.

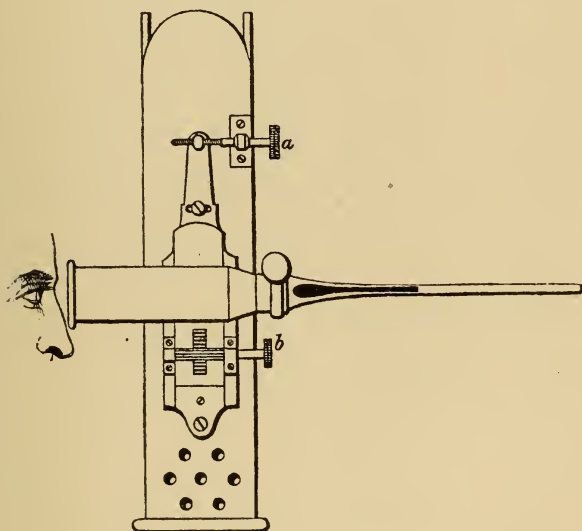


phragm with a very minute aperture is placed directly behind the perforated mirror, and the interior of the apparatus and specula is carefully blackened. To suit myopic and presbyopic eyes adjusting glasses are provided, and these, when required, take the place of the eye-piece.

“To prevent inconvenience from the great heat

evolved by this powerful light the lantern is made of mahogany, and consequently never becomes so warm as to inconvenience the hand; were it of metal it would soon be impossible even to touch it. This end is further carried out by having the

FIG. 2.



top open, and air-holes perforated in the lower part of its sides (*vide* Fig. 2) and in the diaphragm. These arrangements produce a constant draught of cool air through the apparatus, which has the additional good effect of steadying and intensifying the flame.

“The mode of adjustment of the condensing lens and mirror to the pencil of light given off by the edge of the flame is the next point to be explained. The tube, *a* (Fig. 1), is received into a socket, wherein it freely rotates; this socket is mounted on a doubly shifting stage, the mechanism of which will be best understood by reference to Fig. 2. It admits, as may easily be seen, of two motions, right and left, governed by the tangent screw, *a*; up and down, regulated by the rack and pinion, *b*. By this contrivance the lens can be easily shifted about as required. The height of the flame itself is regulated by a button.

“The cannula for the bladder (Fig. 3,) resembled in shape the catheter recommended by Mercier in certain affections of the prostate gland. At the extremity of the long shaft a little window of glass is let in to permit the transmission of light, and is carefully cemented round, so as to render the instrument water-tight. The glass is set in a somewhat slanting direction, so as to obviate the reflection of the light from the perforated mirror, which might greatly embarrass the observer. This form of catheter is easily introduced into the bladder, and then the endoscope may be attached thereto. As the instrument is moved about, the

eye of the examiner can see, bit by bit, the whole surface near to which its glazed extremity can be brought, viz., the border of the prostate, the trigone, the fundus, and greater portion of the posterior surface. The endoscope being held in the

FIG. 3.



left hand and manipulated therewith, the index finger of the right hand introduced into the rectum can give much assistance in the investigation by raising the fundus and bringing it into proximity

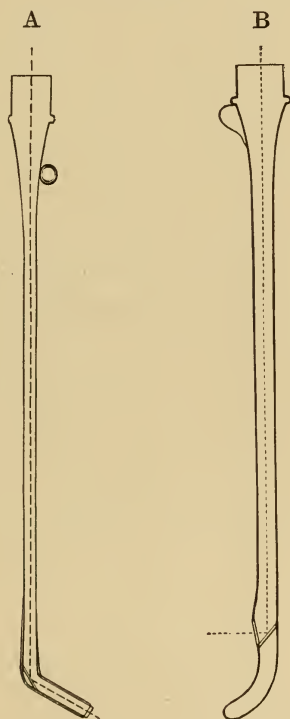
with the exploring tube. The anterior surface of the bladder has heretofore eluded ocular examination, but I am sanguine of being able to remedy this disability ; fortunately it is rarely the seat of disease."

In 1867 Cruise overcame the difficulty of the examination of the anterior wall by an instrument of his own construction which he thus describes :*
" A speculum, in form like the one represented at Fig. 3, in place of having a glazed aperture at the angle, contains there a mirror of polished metal, while the window is placed at the end of the short arm (Fig. 4 A). The light, following the direction indicated by the dotted lines, is reflected by the mirror, and passes through the window ; and when the instrument is directed properly, as indicated by the projecting ring at the outer extremity, it illuminates and exhibits on the mirror the anterior or the lateral surfaces of the bladder. At first I encountered a serious difficulty, which took me some time and study to overcome. So long as the glass window was set at right angles to the ray of light I could see nothing except a brilliant

* F. R. Cruise, " On Irrigation of the Bladder in Cystoscopy," 'The Lancet,' 1889, pl. i, p. 372, Feb. 23rd. This instrument was exhibited at the Dublin meeting of the British Medical Association in 1867.

glare. Thinking out the matter, I came to see that it (the glass window), being in a dark cavity, acted as a reflector, and simply sent back the light.

FIG. 4.



In fact, I realised that I was like a person who, candle in hand, looks out of window into the dark. All that can be seen under such circumstances is the image of the candle itself. Ultimately, by

setting the window at a slight angle (15 degrees) to the direction of the illuminating rays, I eluded this difficulty and saw all clearly. Next I set to work to find a means of examining the neck of the bladder. For this purpose I devised the speculum figured B (Fig. 4). In it the short curve is solid, and just where it commences a lateral window is set, at a proper angle to evade the difficulty already described, and placed opposite a little mirror. The position of the window is indicated by a projecting flange at the outer end of the speculum. A glance at the accompanying woodcut, B, will make these details intelligible, and explain how, when this speculum is rotated in the bladder, whilst jointed into the illuminating tube of my endoscope, bit by bit the neck of the bladder comes into view. With these specula and my lantern I am thus able to take a complete survey of the whole interior and of the neck of the bladder."

Soon after Cruise had perfected the urethroscope Christopher Heath used it at the Lock Hospital in London, and introduced it to the profession in England.* Following Heath is a long list of contributors to the subject: H. Thompson, Pridgin

* Heath, C., "The Endoscope as a Means of Diagnosis and Treatment of Urethral Disease," 'Lancet,' 1866, pp. 408—411.

Teale, Henry Dick, Bumstead, Brunton (otoscope), Mallez, Tarnowsky, Stein (photoendoskop), Wales, Ebermann, Rider, Emmert, Fenger, Weir, Lee, Couriard, Grünfeld,* and others.

Langlebert produced a very much simpler urethroscope in 1868, which could be used with daylight, lamp, or candle. Probably Langlebert's urethroscope was a model of Warwick's in 1867.

With certain changes in the reflection of the light from plane or concave mirrors, and in the source of light, as gas, magnesium light, oxycalcium or Drummond light, sunlight, daylight, candle, and lamp, the endoscope underwent but little modification until the commencement of our *third period*, the electrical, in 1879.

* We are indebted to Grünfeld's article, "Das Endoskop," 'Wiener Klinik,' 1877, for many references to the literature and much sound knowledge.

CHAPTER II.

THE HISTORY OF VESICO-URETHRAL ENDOSCOPY
(*continued*)—THE ELECTRICAL PERIOD.

The Platinum Loop.

ALTHOUGH to Dr. Max Nitze belongs by right the honour and the credit of introducing the method of employing the electric light in the illumination of the deeper cavities of the body, such as the stomach and bladder, for diagnostic purposes; yet the successful use of electric light in endoscopy, and even the method of its production, was by no means an innovation in 1879. Fifteen years prior to the date of Dr. Nitze's original experiments, Bruck,* of Breslau, a dentist, had conceived the brilliant idea of utilising a platinum loop, maintained at a white heat by means

* Bruck, "Das Urethroskop und das Stomatoskop zur durchleuchtung der Blase und der Zähne und ihrer Nachbartheile durch galvanisches Glühlicht," Breslau, 1867.

of a galvanic current, as the source of light for examining the mouth. He constructed and successfully used an instrument of this kind which he called the stomatoscope. He even advocated the use of the electric light in examination of the rectum and bladder ; but the diaphanoscope which he designed for this purpose was tried at the Vienna Hospital and found to be unpractical. The method was forgotten, and the instrument fell into unmerited disuse. The construction of Bruck's diaphanoscope is of the simplest, and as Dr. Nitze's and the Nitze-Leiter instruments are modelled upon the same principle, it will not be out of place to introduce it here by way of illustration.

Bruck's diaphanoscope is represented in Fig. 5.

It will be seen that the incandescent loop of platinum, *g*, is surrounded and kept cool by a water cylinder, *a*, which is supplied with a continual stream of cold water from the cistern, *c*, through the pipe, *d* ; *h* is the battery generating the galvanic current.

Dr. Schramm, of Dresden also, to whom Dr. Nitze was assistant, and from whom, may be, Dr. Nitze received the idea of the platinum loop, had caused a similar instrument to be constructed for

FIG. 5.

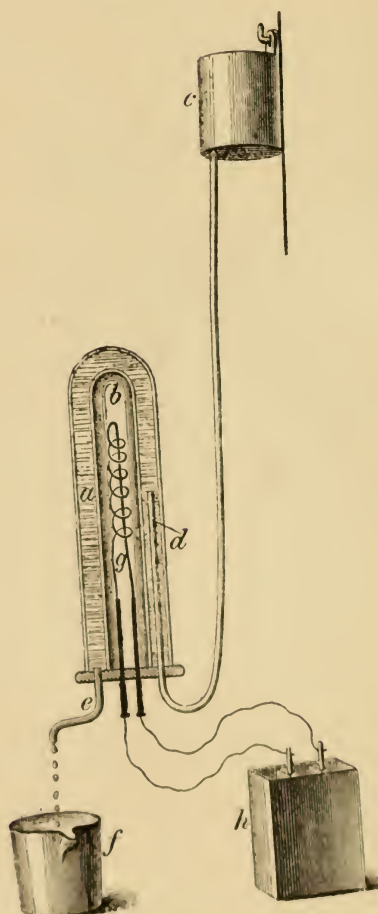
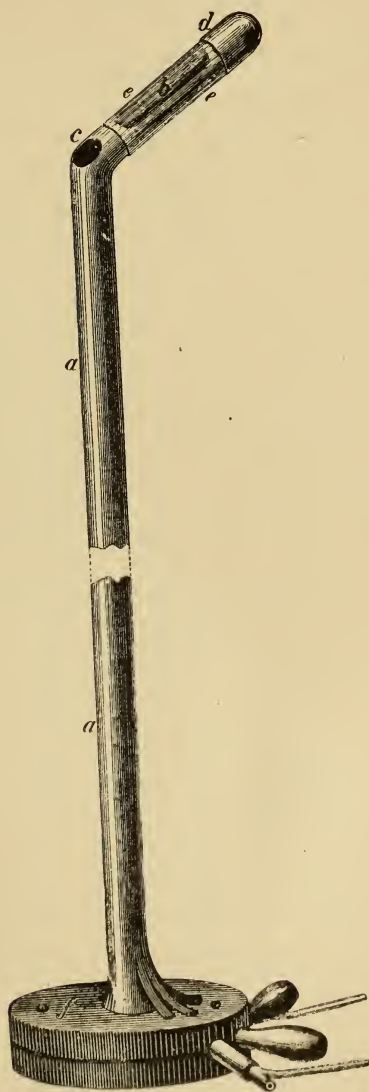


FIG. 6.



diaphanoscopy of the ovaries. The intention was to cause a light placed in the vagina to traverse the abdomen, and to allow the physician to distinguish the outline of, and to notice any change in, the size of the ovary by means of the transmitted light. I have been given to understand that the attempt was partially successful in a darkened room with a very thin subject.

*In the middle of 1876 Dr. Nitze had the skeleton of the future electric cystoscope ready, and in the autumn of 1877 the instrument for the urethra, bladder, and larynx so far advanced that they could be used on the living subject.

In December, 1877, Dr Oberländer, of Dresden, began to use Dr. Nitze's urethroscope, which had been made by Deicke, of Dresden. But the practical completion of the cystoscope and gastroscope presented difficulties with which the Dresden instrument maker, Deicke, was unable to cope, and Dr. Nitze therefore took these latter, as well as the urethroscope, to Leiter, of Vienna.

The cystoscope, which Dr. Nitze submitted to Leiter,† of Vienna, to improve in certain technical

* Oberländer, 'Berlin klin. Wochenschr.,' 1879, No. 48.

† I give these and other details so as to avoid taking any part in the acrimonious dispute as to the priority of invention of the cystoscope.

details, was constructed as follows. It is represented in Fig. 6.

It consisted of the catheter tube, *a*, which was bent at the angle *c*. Both the electric connections and the water-cooling arrangements were very complicated. Thus, along the outside of the concave surface of the round tube two triangular tubes were soldered on; these communicated together at the end-piece, *d*. A third metal tube was fastened in the same way between these two tubes. Into this latter tube a fourth one, insulated by means of a silk covering, was slipped. This fourth tube was for the wire connecting the battery and the platinum loop in the end of the instrument, *b*. The platinum loop was protected by a piece of quill, *e e*. A telescope tube had to be pushed down the length of the instrument until it reached the window, *c*. The principal failings in the instrument consisted (1) in the complicated water-cooling apparatus; (2) in the sharply oval shape of this five-tube catheter; (3) in the quill piece being insufficient to protect the platinum loop from the water in the bladder; (4) in the non-transparency of the quill; (5) in the fact that the quill was apt to get burnt by the heat just at that spot where translucency was needed; (6) the

window of the straight tube not being closed, the lenses of the telescope readily got soiled by the water in the bladder and impeded a clear view.

This, then, was Dr. Nitze's original cystoscope, but with it the interior of the dead bladder was able to be illuminated and demonstrated by Dr. Nitze to a meeting of medical men in October, 1877.*

It is thus evident that Dr. Nitze had carried out this idea of lighting up the interior of the bladder and of examining it by a special optical apparatus whilst it was thus illuminated.

The cystoscope was then entrusted to Mr. Leiter, who simplified and perfected the water-cooling arrangements, besides increasing the capabilities of the light. These improvements were at the cost of ten months of painstaking and expensive labour, which Dr. Nitze gratefully acknowledged before the Medical Society at Vienna.† On account of the prominence thus given to Mr. Leiter, the brilliant innovation of Dr. Nitze is recorded in the

* Prof. Birch-Hirschfeld, who was present, remarked, on examining the bladder, that certain calculi which had been placed in that viscus for demonstration purposes were not vesical calculi, but gall-stones. —Nitze, "Nachwort," p. 308, 'Lehrbuch der Kystoskopie,' 1889.

† 'Wiener Med. Presse,' 1879, No. 26.

literature of that date as the Nitze-Leiter cystoscope.*

The Nitze-Leiter Cystoscope of 1879.

Although this instrument is very similar in outward appearance to the Nitze cystoscope (Fig. 6), it differs very greatly from it in its internal arrangement. We shall therefore explain its construction in detail, and also describe here its necessary accompaniments, viz. the water-cooling apparatus and Bunsen battery, so as to avoid repetition of these latter in the chapter upon the Nitze-Leiter urethroscope.

1. *The Cystoscope*.—The instrument has the form of a calculus sound, of 21 French catheter gauge, with a sharp elbow and a longish beak (Figs. 7 and 8). Two forms are necessary, one (Fig. 7) is for the examination of the neck, anterior wall, and sides

* Neither space, inclination, nor accurate knowledge permit me to enter into the details of the quarrel between Dr. Nitze and Mr. Leiter, which is now detracting somewhat from the real credit of the invention. Those who care to enter upon the present positions of the respective parties may find them in Nitze, 'Lehrbuch der Kystoskopie,' 1889 ("Nachwort," pp. 306—324), and in Leiter, 'Neue Beleuchtungs Apparate,' Wien, 1889 ("Entgegnung auf das Nachwort," pp. 25—31).

of the bladder, and the other (Fig. 8) is for the posterior wall and base. These instruments, however, agree in form, and differ merely in the position of the light and the arrangement of the lens and windows. Thus, in Fig. 7 the light (*e*) and the window (*f*) are in the concavity, and in Fig. 8 the light and the window are in the convexity of the beak and elbow.

Both instruments are made up of three sections :

A. The beak (*c*), which carries the electric lamp.

B. The body or shaft (*a a*), which contains the telescope or ocular tubes and the water-cooling tubes, and conveys the insulated wire from the battery to the lamp. It is furnished with a window at the elbow (*f*).

C. The ocular end (*b*), which is furnished with binding screws for the battery wires and funnels for the water reservoir tubes.

These sections have now to be considered in detail.

A. THE BEAK (Fig. 9).

The entire beak is occupied by the source of light,—the platinum wire. The wire itself has

FIG. 7.

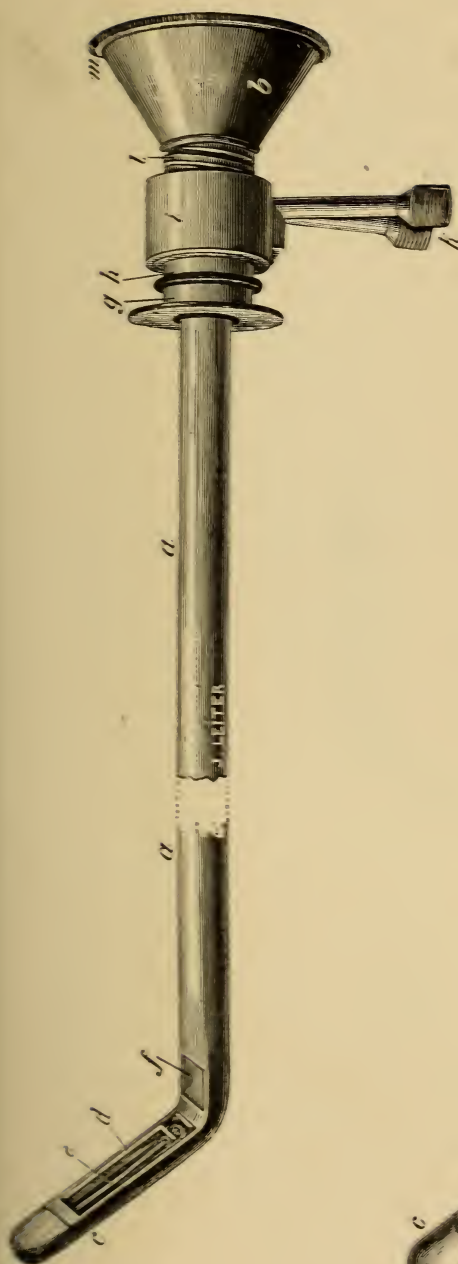
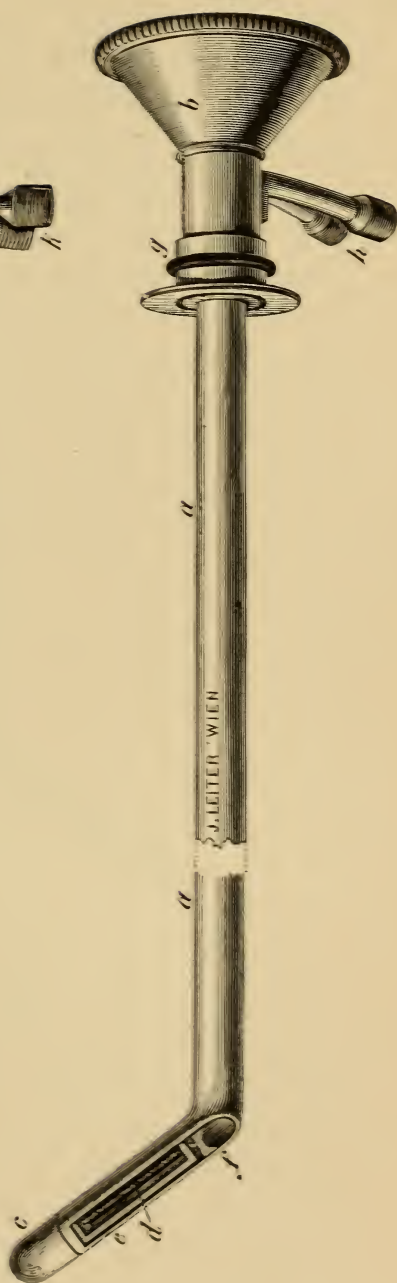


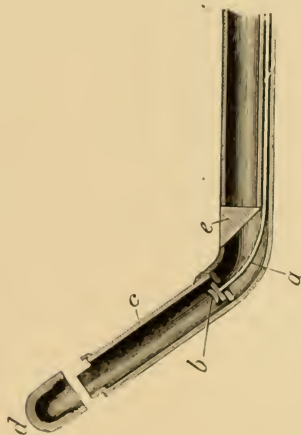
FIG. 8.



been removed in Fig. 9 for the sake of clearness, but it is seen in Fig. 7 (*e*) or Fig. 8 (*d*).

The end of the wire rests upon the little cup, *b*, Fig. 9, and thus comes into connection with the battery by means of the insulated wire, *a*, Fig. 9. The other end is kept pressed against the inner wall of the beak, the wall forming a conducting path for the current and thus completing the circuit.

FIG. 9.



This platinum wire lamp is almost surrounded by a water compartment which is formed by the junction of the two water canals passing along the shaft. The beak has an elongated oval aperture in it 20 mm. long (Fig. 7, *d*), for the exit of the rays of light emitted by the platinum lamp. The

aperture is securely closed by a solid piece of rock crystal. The beak terminates in a cup, *d*, Fig. 9 (Figs. 7 and 8, *c*), which can be screwed off and on in order to allow of access to the platinum wire.

B. THE SHAFT.

B. The shaft or body of the cystoscope is little more than five inches in length, and is of 21 French catheter gauge in size. It is divided into four compartments (Fig. 10). The largest of these is the centrally placed telescope tube, which extends from the window at the elbow to the ocular or external end. It measures 5 mm. across, and is provided with a system of lenses at either end and in the middle, like a microscope, for increasing the size of the image refracted through the window prism (*f*, Fig. 7 ; *e*, Fig. 9). Along one side of this telescope tube are placed two water

FIG. 10.



canals or compartments (Fig. 10), which unite, as we have just mentioned, in the beak. The shaft has, moreover, an insulated compartment for the

conveyance of the conducting wire for the platinum loop. This is placed between the two water canals. The window is furnished with a prism (Fig. 9, *e*) to refract the entering rays of light directed along the shaft to the observer's eye.

C. THE OCULAR END.

c. The ocular end is furnished with the funnel-tubes (*h*, Fig. 8), which place the water canals and terminal compartments of the cystoscope in open communication with the water reservoir, so that a continuous stream of cold water can be made, under pressure, to traverse the length of the instrument and effectually absorb the great heat emitted by the platinum loop when in action. The ocular end also possesses a grip or binding screw for the attachment of the connecting cords from the battery—one of these connecting cords is placed in contact with the insulated wire in the shaft of the cystoscope and the other is attached to the metal wall of the instrument, which serves as the completer of the circuit.

A small knob on the ocular ring serves to show the position of the beak.

2. *The Water-Cooling Apparatus.*

The heat which is evolved by the platinum loop is so great that a water-cooling apparatus is absolutely indispensable. We have just described the channels through which the water may enter the cystoscope, traverse its shaft, surround the lamp, and pass off, after absorbing the heat of the lamp, by means of an exit tube (Fig. 8, *h*). It is obvious, however, that a large amount of water pressure is requisite in order to obtain a continuous current of cold water through such narrow and tortuous tubes. To secure an uninterrupted flow the reservoir has either to be greatly elevated, or the water has to be driven up out of a tank placed on the floor by means of appropriate pressure. The former method is less complicated, and Fig. 11 shows the apparatus which was generally supplied. From the reservoir, *d*, which could be raised or lowered by means of a pulley, the water is carried to *c*, where the force of the current could be regulated by means of a tap before it traversed the cystoscope or urethroscope (*i*). The outfall was allowed to drop into the receiver, *l*.

A less cumbersome but more complicated water apparatus was subsequently made. It is repre-

FIG. 11.

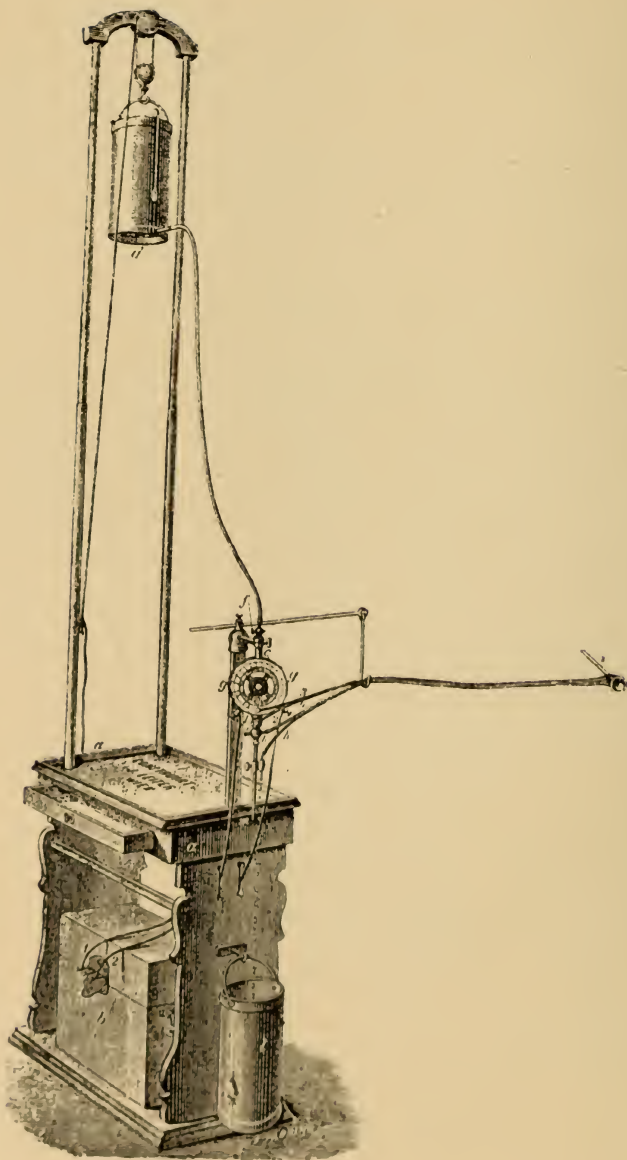
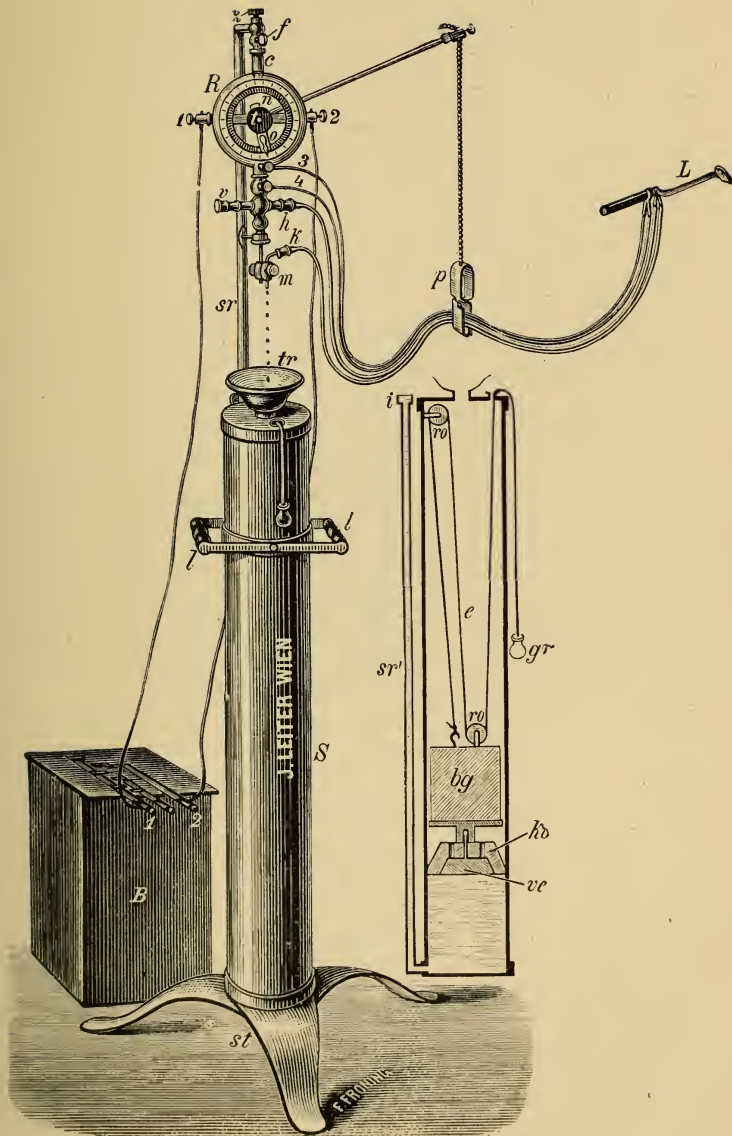


FIG. 12.



sented in Fig. 12. It will be seen that the water in the reservoir is forced upward through the tube, *i*, by the pressure of a heavy plunger weight, *bg*. It will be observed that once filled, the reservoir is self-feeding, for the plunger weight is so valved that it offers no obstruction to the re-accumulation of the outfall from the cystoscope into the reservoir through the funnel, *tr*. With proper adjustment the weight did not need to be raised oftener than once in twenty or thirty minutes.

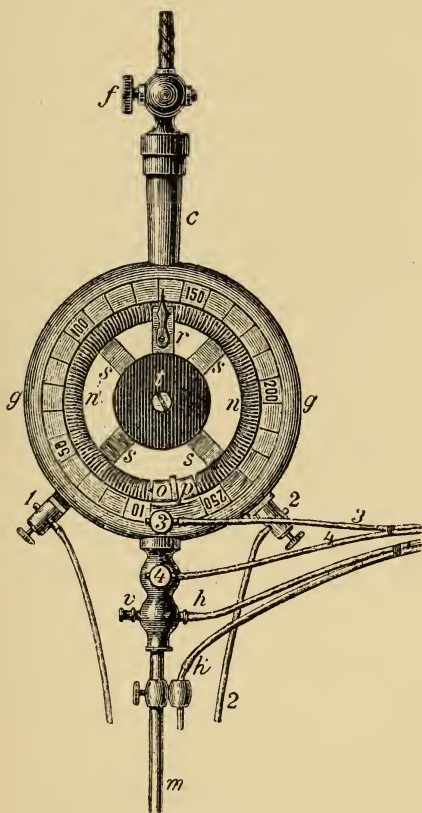
3. *The Bunsen Battery.*

To obtain the necessary heating and illumination of the platinum wire, an equable constant current of a certain intensity was of course necessary. This could only be obtained from a large and cumbersome battery fitted with a rheostat. The best battery for this purpose was that furnished with Bunsen elements. It will be seen in Fig. 11, *b*. Seeing, moreover, that the platinum wire was easily fused if too strong a current was passed through it, a current regulator or rheostat (Fig. 13, or Fig. 11, *g g*) was indispensable.

This battery had to be refilled before, and

emptied after every operation. Its smell was often distressing.

FIG. 13.



The ease with which the platinum loop was fused, even in skilled hands, and with the additional protection of a good rheostat (Fig. 13), can

be gathered from a letter which Mr. Schall wrote to the 'Lancet' on February 11, 1888. Mr. Schall had to repair the platinum loop of a cystoscope nearly every week for two years. The instrument belonged to a distinguished German specialist who persevered in its use, and though well skilled in galvanic technique could not avoid the almost weekly fusion of the wire. The instrument therefore was rarely out of the hands of a skilled mechanic.

The Capabilities of the Nitze-Leiter Cystoscope.

Directly the Nitze-Leiter Cystoscope appeared, its fame spread far and wide. Professional men in every civilized nation hastened to accord it a fair trial. Some wrote an account about its powers, others exhibited the instrument, few, however, persevered in its use.

Dittel, Nicoladoni, Ultzmann, Maas, and Oberländer all spoke warmly in its favour. Sir Henry Thompson brought it before the Royal Medical and Chirurgical Society in England. Roswell Park advocated its use in America.

Sir Henry Thompson, whilst demonstrating its use upon a patient at the Royal Medical and Chirurgical Society,* spoke with but little enthusiasm of its powers, and plainly indicated its greatest defect in saying "that he was indebted to Mr. Weiss for his intelligent and careful management of the apparatus, since it was essential for this, as well as for its maintenance in good working order, that it should be under the care of a person well versed in the use of galvanic apparatus, and competent to adjust or repair if necessary the very delicate details which formed the essential parts of this somewhat complicated but very complete instrument." It was evident that an instrument which needed the constant supervision of a skilled mechanician would find but little favour with practical surgeons, and Sir Henry Thompson struck the key-note of its subsequent disfavour in the words we have just quoted.

In a lecture on the "Diagnosis of Surgical Urinary Disease,"† Sir H. Thompson gave his opinion upon the instrument in the following words: "There are some morbid conditions the existence of which we sometimes suspect but can-

* 'Lancet,' p. 529, April, 1880.

† 'Lancet,' Dec. 6th, 1879, p. 823, pl. 2.

not positively affirm to exist, whose presence may now be ascertained through the agency of the new endoscope (the Nitze-Leiter). I refer to the identification of sacculated stone as the cause of persisting and unrelieved symptoms; to the detection of pedunculated growth, and of villous disease of the bladder removable by operation; and, lastly, to the investigation of the nature of foreign bodies other than calculi which have become lodged there. All these cases are, however, more or less rare; nevertheless *it is our duty** to be provided with every resource, whatever it may be, which enables us to deal more effectively than heretofore with conditions on the management of which grave issues depend. . . . I have lately seen a fatal case of vesical growth which might have been easily removed by operation; in such a case the new endoscope may possibly render essential service."

Unfortunately, however, the Nitze-Leiter cystoscope does not seem to have fulfilled the expectations which were thus raised in England. In a series of forty-three cases of obscure vesical disease which commenced in 1880, and which comprised twenty cases of vesical growth, Sir H.

* The italics are our own.

Thompson does not *once* make mention of having used the endoscope which he had in his possession, but states that he resorted to digital exploration for diagnostic purposes.*

We learn also from other sources, that another Nitze-Leiter instrument was obtained by Khroné and Sesemann, of Duke Street, W., that it was tried at a hospital and returned the second day afterwards with the platinum wire fused, and a note to the effect that the instrument was too complicated for practical purposes.

John Weiss and Son write† also to the ‘Lancet,’ February 4th, 1888, to say that they have still the original instrument shown at the Royal Medical and Chirurgical Society in 1879 in their possession.

The reason why the Nitze-Leiter cystoscope failed to receive recognition will be realised by anyone looking at Figs. 11 or 12. Its cumbersome-ness can thus be estimated at a glance. We have said sufficient to prove its extreme complication, and it only remains for us to add that its working was decidedly fickle and its cost a very great one.

* ‘Tumours of the Bladder,’ 1884.

† ‘Lancet,’ “Electric Illumination of the Male Bladder.”

CHAPTER III.

THE INCANDESCENT-LAMP CYSTOSCOPE OF 1887..

AT the time of the construction of the Nitze-Leiter cystoscope of 1879, the Edison incandescent lamp had not been patented ;* and although, even when the construction of the latter had been made public, and its employment as a source of light in endoscopy was fully recognised and made use of in the specula for the throat, nose, ear, and rectum, yet it was not until 1887 that the incandescent-lamp cystoscope for the *male* subject made its appearance. It is difficult to understand the reason for this delay.

Dr. Newman, of Glasgow,† in 1883 devised and used an electric endoscope for the female bladder, and found when the bladder was well illuminated the orifices of the ureters were easily seen and could be catheterised.

* Vide Appendix.

† 'Glasgow Med. Journ.,' Aug., 1883; also 'Lectures on Surgical Diseases of the Kidney,' 1888, p. 415.

Mr. Mayo Robson,* in 1885, also introduced a small half-candle Swan electric lamp into a female bladder through the dilated urethra, and was thus able to illuminate the interior and display a carcinomatous growth.

In March, 1887, two incandescent-lamp cystoscopes appeared before the public almost simultaneously,† one after the design of Dr. Nitze (who had quarrelled with and left his former co-worker, Leiter, of Vienna), made by Hartwig, of Berlin, the other emanating from the firm of Leiter, of Vienna. Although these two instruments are the same in principle, yet they differ somewhat in detail; we shall attempt to place before the reader a description of each, and our practical experience of the relative value of the two forms.

The Nitze Incandescent-Lamp Cystoscope.

The instrument retains the appearance of a short-beaked calculus sound of 22 gauge (French) in size. Three parts of it demand explanation.

The Beak.—The beak is short, and contains

* 'Lancet,' Aug. 22nd, 1885, pt. 2, p. 341.

† Nitze, 'Illustrirte Monatschrift der ärztlichen Polytechnik,' March, 1887; Leiter, 'König. Gesellschaft der Aerzte zu Wien,' March, 1887.

the small incandescent lamp. The tip of the beak is in the form of a hollow silver cap (G S, Fig. 14), which has a small oval slit in it for the passage of the rays of light. This slit is only covered in with the thin glass of the lamp. The cap fits on to the body of the beak,—S screwing into S'. Into this hollow cap a small Edison or Swan incandescent lamp is cemented. One terminal of the carbon filament comes into contact with the insulated wire, W, when the cap is screwed home; and the other terminal becomes connected at the same time with the outer wall of the cystoscope, which serves as one of the conducting paths to connect the lamp with the battery. It will be realised that the carbon filament is burning naked in a globe and lacks a rock-crystal window (*vide* p. 41). Should the filament burn through, the tip has to be sent to the instrument-maker for repair. Generally, the operator has two or more silver tips all armed with the carbon filament soldered in and ready for use, so that if one fails another can be screwed on immediately.

The Shaft.—A glance at the figure (Fig. 14) will show that the calibre of the shaft of the cystoscope is no longer encroached upon and

diminished by water-cooling compartments as in the Nitze-Leiter of 1879. It is given up almost entirely to visual purposes, and forms a hollow

FIG. 14.



This figure is taken from Nitze's article.

tube furnished with a system of lenses, for increasing the size of the object examined.

Rays of light from the object under examination enter the window situated at the bend of the elbow, are refracted by the prism, P (Fig. 14), closing the window, and, passing through the system of lenses just mentioned, are perceived by the observer's eye.

It will be noticed that the window and the light are in this instrument placed upon the concavity. There is another in which the light and the window, P, are placed upon the convexity, as in the 1879 instrument, but here the window is closed with glass and has no prism.

The Ocular End.—The end at which the observer's eye is placed has an arrangement for connecting the battery wires with the insulated wire, W (Fig. 14) and the outer wall of the instrument. A slot under the management of the thumb serves as "a key" for opening and shutting the circuit.

Dr. Nitze has also invented another cystoscope in which the window is situated, not at the elbow but on the convexity of the *beak* itself. It is used for cases in which an enlarged prostate is encountered.*

* Nitze, "Beiträge zur Endoscopie," 'Verhand. der Deutschen Gesellschaft für Chirurgie,' p. 184, 1887. 16ter Congress.

Leiter's Incandescent-Lamp Cystoscope.

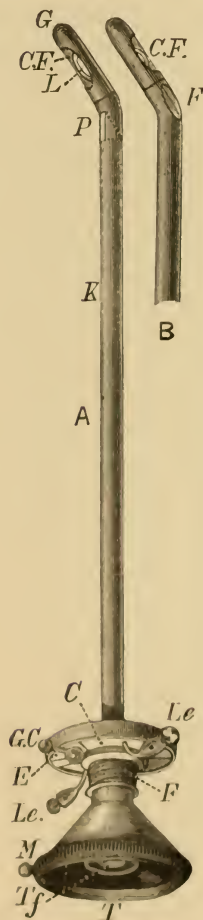
The cystoscope produced by Joseph Leiter, of Vienna, is a reliable and highly finished instrument. It is very similar in appearance to the Nitze cystoscope, possessing, however, a longer beak, a shorter shaft, and a differently arranged ocular end. Two forms are represented in Fig. 15 (A and B).

In A the window and the light are on the concavity, and in B the same are on the convexity of the elbow and beak of the instrument.

The Beak.—The entire beak (Fig. 15, G ; Fig. 16, G) is a hollow hood (Fig. 16, G), which can be screwed on and off the shaft of the instrument (Fig. 16, Le). It has a long, oval aperture, C F, covered in with a thin pane of rock crystal. The hood, G, when screwed on, protects the small incandescent lamp (Fig. 16, L). The terminals of this “Mignon” lamp fit into two sockets, C C, which are in direct communication, by means of insulated surfaces, with the battery. Here we have the first practical point in the difference between the Nitze and the Leiter cystoscopes. In Nitze's, if a carbon filament burns through, we are forced to send the

entire tip, *i. e.* an integral part of the instrument, to the makers for repair. But in Leiter's, if the

FIG. 15.



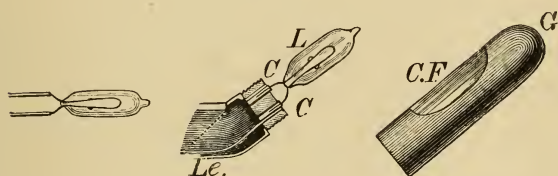
The two forms of Leiter's electric cystoscopes, A and B.

same accident happens—and it does pretty fre-

quently at first in unskilled hands—all that is needed is to unscrew the hood, pull out the little lamp with the fingers or forceps, take a fresh one from our store, fit the terminals in the sockets, screw on the hood, and we are again at work after a pause of perhaps a couple of minutes.

By this little manœuvre we avoid the unnecessary trouble and delay of constantly sending our cysto-

FIG. 16.



(1) the lamp ; (2) the lamp (L) adjusted ; and (3) the silver hood (G) for the lamp (in Leiter's cystoscope).

scope tips to Berlin, to say nothing of the expense of repair. These little incandescent lamps, so readily adjustable in the Leiter's instrument, cost about half the price of repairing the Nitze filaments.

But there are other important differences : 1st. It will be seen that the apertures in the caps or hoods for the passage of the rays of light are of different sizes. That found in Leiter's instrument is a much larger and longer oval, and gives a proportionately larger area of light,—no small

consideration in the bladder. 2nd. It will be seen that if the lamp-glass should break in Leiter's cystoscope it is still further protected by the hood.

The shaft of Leiter's is practically the same as in Nitze's cystoscope. Its size is 22, 30, or 40 (French gauge).

The ocular end possesses two binding screws, Le Le, Fig. 15, for the battery wires, and a small switch, "kick-over," or key, G C, for opening and shutting the circuit. A small knob, M, on the rim of the ocular end serves to show the direction in which the beak is pointing, and thus helps us to localise the position of the lamp and the window in the bladder. Tf points to the external end of the telescope tube, which can be drawn out for cleansing purposes.

*Comparison between the two Patterns, the Nitze
and the Leiter.*

Both possess advantages and both disadvantages.

1. The Nitze pattern is a little too long in the shaft; the Leiter too short.

2. The Nitze beak is of the proper length; the Leiter is too long.

3. The Nitze elbow is well rounded ; the Leiter is too abrupt.

4. The Nitze lamp is most unpractical;* it gives out less light. It is unguarded, more delicate, and is much more expensive than the Leiter.

5. The arrangement of the binding screws in the Nitze is more convenient than in the Leiter.†

The Author's Instrument.

Rapidly recognising the advantage of having a cystoscope combining the good points of each maker, I had one constructed for me on the following plan (Fig. 17) :

The Leiter hood and adjustable mignon lamp, is retained. The hood is perforated to allow of a free current of water to surround the lamp (Fig. 18, C F).‡ By this means the hood is kept *perfectly cold*. If I find the water difficult to keep clear of blood I slip on the non-perforated hood.

The length of the beak is reduced to less than an inch, the elbow is well rounded, the length of

* Compare p. 41.

† It appears that this method of contact was employed first by Leiter in the old Nitze-Leiter.

‡ I break more lamps, perhaps, in the long run, but incur less risk of burning the mucous membrane.

the shaft is seven and a half inches. The ocular end is fitted with a rotatory plate carrying the

FIG. 17.



FIG. 18.



binding screws C D, whilst instead of the Nitze slot-key, a small screw, B, on the face of the plate

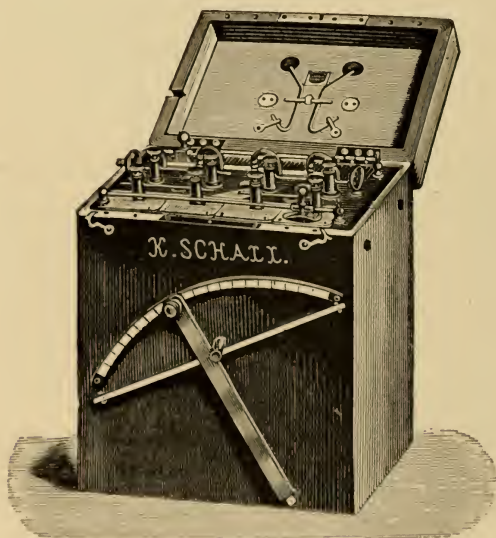
forms a more convenient switch. The size is 23 French gauge. An ebonite edging to the ocular rim prevents any escape of the current which would take place if a *metallic* rim was touched by a sweaty eyebrow.

The Battery.

As the battery for working the cystoscope is the same as that employed in the use of the urethroscope we shall introduce it here, and merely refer to this chapter in our subsequent description of the latter instrument. Almost any form of battery supplying a constant current of 6 to 8 volts intensity may be used. After trying a variety of batteries I have at last found one admirably suited to the purpose, which is made by Schall, of Wigmore Street. It is an ordinary six-cell chrom-sulphuric plunge battery, with a very convenient lever arrangement for immersing the carbon-zinc elements in the fluid (Fig. 19). It is fitted with a rheostat. This latter is absolutely indispensable. If the battery be without one, constant failure is certain and endless annoyance and expense is incurred.

Nitze* recommends a small six-celled battery made by Hartwig, of Berlin, with Grenet elements. He further mentions that little accumulators may be used which slip into the pocket. There may be

FIG. 19.



a future for these *small* accumulators, but I can only say they are at present most unsatisfactory.

Schall's six-celled battery, if well worked, will need re-filling every two or three months.

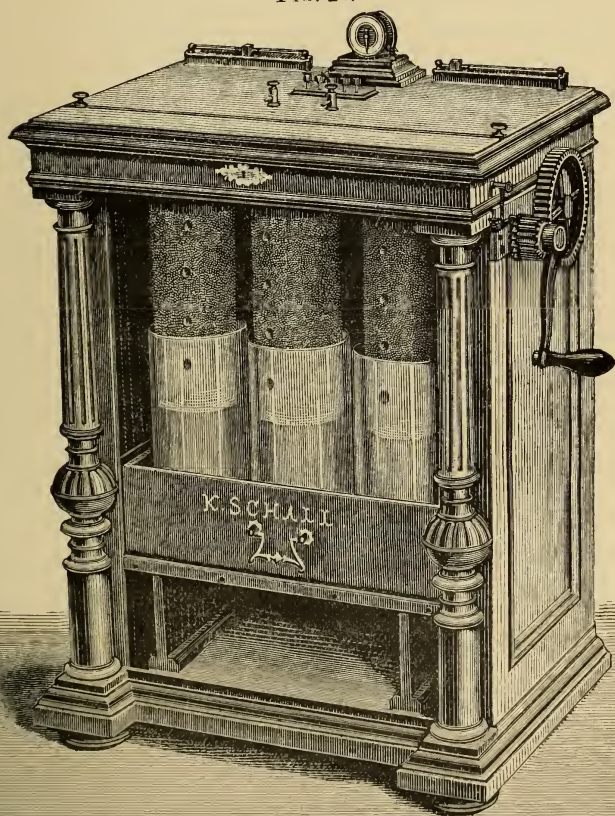
A very convenient form of large battery is supplied by Schall (Fig. 20), which is fitted with rheostat and galvanometer for cautery and light,

* Nitze, op. cit., p. 182.

and only needs re-filling every nine to eighteen months.* It is, however, more useful for hospital work or a specialist than for private practice.

I need hardly say that the success of cystoscopy

FIG. 20.



* I have been informed that Dr. Oberländer, of Dresden, used the same fluid for nearly two years.

and urethroscopy depends largely upon the battery, and the more careful the practitioner is in his choice of a reliable apparatus, so much greater will be his power of diagnosis.

Secondary Batteries.

Accumulators of moderate size are now being made, and as they will, when more improved, undoubtedly replace primary batteries, it will not be unprofitable to draw especial attention to them here.

Accumulators (Fig. 21) have this advantage, that they do not require any manipulation, such as the plunging of plates in and out of the fluid. The plates remain in the acid, and the required current is constant and needs only to be switched on.

Such accumulators, therefore, need not stand in the consulting room, but may be connected with it by means of cables.

An accumulator requires recharging from a dynamo once in two to six months, according to its size.

The drawbacks of the accumulators are, however :

1. Their great weight.

2. The lead plates fall to pieces, and have to be replaced by new ones.*

FIG. 21.



3. The medical man is dependent upon an electrician to recharge them.

* Even in the hands of a thorough electrician five years is considered to be a very long life for an accumulator.

Objections to the Use of the Cystoscope.

Two objections might reasonably be made to the use of the incandescent-lamp cystoscope :

1. *Burning of the Mucous Membrane.*—Although the heat emitted by the cap or hood with its contained incandescent lamp, when in action, is not so great as that given off by the platinum wire lamp, yet it does become very quickly hot if it is allowed to burn in air instead of under water.

Thus it becomes warm after four seconds, unbearable after ten, and scorches the skin severely after fifteen seconds. If, however, the tip of the instrument is placed in water the heat is rapidly absorbed and the cap or hood remains cool and may be touched with impunity even after an hour's use. This is exactly what happens in the bladder, for the urine carries off the heat of the lamp as fast as it is formed. "They may be burnt for an hour in a male bladder, holding seven ounces of fluid, without perceptibly raising the general temperature" (Brenner).* It is therefore a *sine quâ non* in electric cystoscopy that the bladder has

* Brenner, '16ter Congress deutschen Gesell. für Chirurgie,' p. 91.

to contain five or six ounces at least of urine or water. Now, although the urine or water absorbs the heat of the cap if it be freely surrounded by the medium, yet this does not happen if the cap be held in contact with the vesical wall.

A just estimate of what would happen if the cap were kept in contact with the bladder wall may be very advantageously gained by the operator in carrying out the following simple experiment: Burn the lamp in a cupful of water and gently rest the tip of the finger on the hood. The finger will soon become unpleasantly warm. The rest of the hood will of course be found to remain cool, for it is surrounded by water. When the operator, moreover, realises that the soft mucous membrane of the bladder is infinitely more sensitive than the hard cutis of the finger and less tolerant of injury, the necessity for avoiding any prolonged contact of the lamp with the bladder wall will be readily appreciated.

The perforated hood which is adapted to my own cystoscope does away with much of the danger of burning the mucous membrane, for the water circulates through the small holes and is in direct contact with the lamp (Fig. 18).

2. *Breakage of the lamp.*—It might be feared

that the contact of the water with the heated hood would crack the small lamp, or might even split the rock crystal plate which covers the aperture for light. If there was any chance of such an accident happening it would be fatal to the use of the cystoscope altogether. The fear is happily quite groundless in the *Leiter pattern*. If an ill-made lamp should shiver—and I have never heard or known of such an event—it would still be enclosed in a metal hood, the aperture in which is occupied by an unbreakable plate of rock crystal two millimetres thick.

I have tested these rock crystal plates with over-anxious roughness, tapping them roughly on a marble table-top, rapping them with a stone so as to imitate—to a very exaggerated degree—any violence they might be subjected to if they came in contact with a vesical calculus. The only result has been to break the carbon filament of a Nitze cystoscopic lamp. I have also applied firm finger and thumb pressure on the plate, but have only succeeded in cracking one, and this cracked one I subsequently and frequently used without any damage being done to the little globe within.*

* As this was passing through the press I learnt that a rock

Having now described the Nitze-Leiter instrument of 1879, and the new incandescent-lamp cystoscopes of 1887, it will be most advantageous to enumerate the advance made by the latter.

1. The new instruments do not need any water-cooling apparatus, and therefore the unwieldy reservoirs are dispensed with. The shaft of the instrument is also freed from its water compartments: almost its entire calibre is therefore given up to the telescope-tube, and hence a much larger field of view is obtainable.

2. The cumbersome Bunsen battery and complicated rheostat is unnecessary: it is replaced by a small plunge battery supplying a current of six to eight volts intensity. The former battery emitted a most offensive smell, and had to be emptied after each operation. The latter has to be refilled once every two or three months, and can be placed in action by merely raising a lever.

3. Accumulators which slip into the pocket along with the cystoscope may be used, though

crystal plate had been broken by burning the lamp in the air for some time, and then plunging it into water: comment is superfluous.

the former are not always to be relied upon (compare Fig. 12), contrasting thus favorably with the old instrument, which required a porter to carry it (Fig. 22).

FIG. 22.



4. The new instrument is one third the price of its predecessor, and the outlay once made, the only further expense is the battery fluid and a stock of small lamps.

5. The instrument is not complicated nor fragile; it requires no special technical knowledge for its manipulation; indeed, if a Leiter's cystoscope is procured there is no need for any further assistance from the instrument-makers, for all the

necessary changes of lamps can be done in a minute or two by the practitioner himself.

“Improved” Incandescent-lamp Cystoscopes.

Mr. Whitehead, of Manchester, has introduced an improvement in the *size* of the instrument. The cystoscope which Mr. Leiter has made at his request is identical in principle with the new pattern, but of 40 Fr. gauge instead of 22 Fr. The advantages of this increased size lie in the wider field of vision obtained, and the employment of a larger incandescent lamp, with correspondingly increased brilliancy of light. The window of observation in the new instrument is $\frac{6}{16}$ in. square, *i. e.* at least twice the area of that in the original one; and the lamp is double the size. Mr. Whitehead introduces this instrument through a median incision in the membranous urethra. A small opening is made on the staff, and a catheter probe passed along it. Sufficient urine is now evacuated to show that the bladder has been reached, and the staff thereupon withdrawn.

The operation is now facilitated by using a conical-pointed pilot catheter of 40 French gauge

to dilate the prostatic urethra. This instrument is guided to the bladder through the perineal opening by means of a flat director previously inserted. The bladder is washed out, and injected through the pilot catheter with boracic solution. The left index finger is then placed in the rectum, and pressure is made on the vesical neck so as to prevent the outflow of the medium whilst the pilot is being withdrawn. The cystoscope is finally introduced. Mr. Whitehead* speaks well of the instrument, saying that "the illumination and the field of vision left nothing to be desired." The innovation is a valuable one, although it directly traverses the *raison d'être* of cystoscopy, which is that it affords a visual diagnosis without a cutting operation. It at once suggested the employment of a larger instrument upon females. This has proved invaluable, for with a slight dilatation of the female urethra No. 40 French cystoscope is easily passed. Leiter has made at my suggestion such an instrument to be used exclusively for the female bladder. Its shaft is four and a half inches in length.

Even with a slight experience of this larger

* "A New Incandescent-lamp Cystoscope," 'British Medical Journal,' April 7th, 1888, p. 768.

size of incandescent-lamp cystoscope one can conceive that it will be of the greatest value in that class of case in which the exploring finger cannot reach the bladder through the membranous urethra by reason of certain mechanical obstacles, such as (1) the stoutness of the patient, by which the depth of the perinæum is increased; (2) an enlargement of the prostate, by which the bladder is pushed farther from the surface; (3) a considerable narrowing of the pelvic outlet, which prevents the hand being well pushed into the perinæum* (compare Chap. VII, a case of sacculated stone under the care of Professor Dittel).

It will be also of importance in controlling digital exploration by visual examination in that variety of vesical papilloma which is known by the names of "sub-villoid," "cropped villoid," or "papillôme en nappe."

In these cases there is no definite clump or clumps of growth, but large areas of the mucous membrane of the bladder are converted into a velvety condition, which can easily remain undetected by the finger, but the existence of which a

* Whitehead and Pollard, 'The Surgical Treatment of Tumours and other Obscure Conditions of the Bladder,' p. 9.

visual examination will at once reveal. These velvety patches are composed of innumerable blunt, stunted, isolated papilliform projections.

There are eleven specimens of this disease in the museums of England and Scotland. It is found in 18·3 per cent. of the cases of vesical villous papillomata.*

The following case† will add weight to the above statement :

CASE.—Male, æt. 28. Onset of symptoms of vesical disease in 1882. Frequent micturition with a sense of burning at end of act, pus and occasionally blood. In 1884 perineal cystotomy and exploration performed ; no relief afforded. In 1885 cystotomy and exploration repeated, with a like result. The frequency continued, the patient micturating every hour, day and night. Urine still contained blood and pus.

Patient then applied to Professor Keyes, of New York. A supra-pubic cystotomy was performed, and the pelvis placed in what is known as the Trendelenberg position.‡ By this means and

* Author, " Villous Papillomata," ' Path. Trans.,' 1888.

† Keyes, ' Journal of Cutaneous and Genito-Urinary Diseases,' July, 1887, p. 247.

‡ Willy Meyer, " Ueber die Nachbehandlung des hohen Steinschnittes," ' Langenbeck's Archiv,' xxxi, 1884.

a good light, the mucous membrane was seen to be the seat in one third of its extent of a finely sub-villoid growth, which bled at the slightest touch. It occupied the base and anterior wall. There was no tubercular deposit, and no ulceration. The line of demarcation between the healthy and the diseased parts was well marked. The curette was used with a good result. Had the cystoscope, and preferably the large size, been used through the perineal incision, the second and the third operation would have been dispensed with.

Lastly, the larger instrument may be used to regulate the *complete* removal of a vesical tumour by the Boutonnière operation, just as the mirror is used by the dentist to control the burring of the carious parts of a tooth preparatory to stopping.

The departure therefore is a valuable one, but it cannot be forgotten that it is the adjunct of a *cutting* operation, and that it does not attempt, as the smaller sized instrument does, to furnish a diagnosis of obscure vesical disease without operative interference.

The Brenner Modification.

In December, 1888, Mr. Leiter constructed an instrument at Dr. Brenner's request, whereby the water in the bladder could be changed without removing the cystoscope. It consists, as Fig. 23 will show, of a small tube soldered on to, or incorporated with, the shaft of the instrument which is used for viewing the posterior wall. The canal terminates just below the window. M is the stylet.

Dr. Brenner has attempted to catheterise the ureters of females with it by passing a fine catheter, K K, through the tube, directly into the mouth of the ureter, exposed by the light. In one female case he successfully passed catheters into both ureters, but failed in the male subject.*.

The idea of washing out the bladder without removing the cystoscope was not, of course, novel.

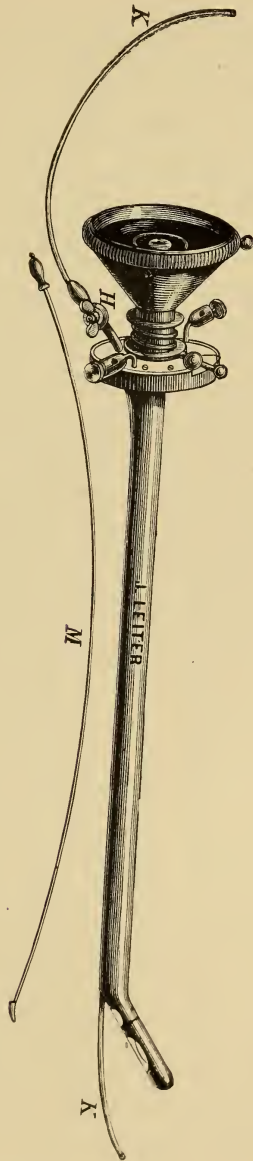
Mr. Harrison,† of Liverpool, had also instructed Leiter to make an irrigating cystoscope in March, 1888.‡ But the means whereby the idea is carried out is insufficient if blood is in any quantity, and

* Leiter, 'Neue Beleuchtungs Apparate,' 1889, Jan., p. 8.

† Harrison, "Endoscopy with the Electric Light," 'Lancet,' May 26th, 1888.

‡ Cf. also Berkeley Hill, 'Lancet,' Jan. 26th, 1889, p. 169.

FIG. 23.



in these cases alone is such an irrigating cystoscope needed; the fine channel will become clogged with clot and useless. I have had Brenner's pattern, and I believe Mr. Harrison has also used it; it has been returned by both of us as "unpractical."

As regards its adaptability for catheterisation of the ureters of the female, I have nothing against it. The orifices of the ureters will be rarely found, however, so patulous or so well placed as to allow of such a proceeding being accomplished by means of this instrument.

This and other channelled cystoscopes are of value in carrying out two or three manoeuvres of practical value. As Dr. Brenner has overlooked them, I would like to draw attention to them here. The first consists in examining the suppleness of the mucous membrane by watching the infolding of the surface as the water is allowed to trickle away, and secondly, in estimating in the same way the depth of growth or attachment of a given tumour—if, for instance, it slides with the mucous membrane or remains fixed when the bladder contracts,—and lastly, by directing a jet of water against any small growth we are inspecting, we are able to ascertain by the amount of motion or oscillation thus communicated to the body whether

we have to deal with a pedicled or a sessile growth, —a most important element in deciding our future treatment.

A few words of advice in buying an instrument may be not unacceptable. The Leiter cystoscope is the better and the more practical instrument of the two. The modification which Mr. Leiter has made for me is the most convenient, and, I believe, the one usually sold now by Leiter. See that the straight part or shaft measures seven and a half inches. See that the lenses are bright and clear, giving a good and a large image* of the window or some other object in the room, and of the hand or finger placed near the window of the cystoscope, because in some of the instruments supplied the lenses are not accurately placed. Make sure that the insulation is perfect. Let the lamp be put into action. Shake the instrument and place it in various positions to see that the light is still maintained. Does the ocular knob indicate correctly the position of the beak? Lastly, in choosing a stock of lamps have

* The image ought to have the diameter of a shilling. Place a shilling, face towards you, edgeways against the tube, and compare the size of a shilling with the area of the object seen through the cystoscope; the latter is, or ought to be, slightly the larger.

every one tested with the battery, and select those which give out the brightest light with the weakest current.

The battery requires but little notice. The chief failure rests in the evaporation of the fluid, the chief disaster in the practitioner forgetting to lift the carbon and zinc elements out of the fluid after he has finished. A few hours of such contact will erode and crack the plates and will necessitate the renewal of the acid.

CHAPTER IV.

REMARKS UPON THE USE OF THE INCANDESCENT-LAMP
CYSTOSCOPE AND ITS CAPABILITIES.

THE management of the instrument requires, as we have said, but little technical knowledge, but the power of gentle and *purposive* manipulation of the cystoscope when in the bladder can only be acquired by extensive practice. Those who are constantly in the habit of using the calculus sound, and of passing solid steel bougies or metallic catheters, will have nothing to learn in the actual introduction of the cystoscope into the bladder, for the latter is as easy as the former; but the pointing of the beak, and due rotation of the instrument so that a certain patch of the bladder wall may become illuminated and examined, requires a great deal of practice and much patience. It is wise to use the instrument freely on the dead subject first, for we gain thereby a more rapid knowledge of the capabilities of the instrument than we can expect

to acquire on the living. The various little manipulative dodges of gently *placing* the light are also learnt. Leiter supplies a phantom bladder which is extremely useful if the mortuary subject cannot be obtained. This phantom has a small window at the top through which the interior of the bladder and the position of the light may be inspected. The eye can thus guide and teach the hand which is manipulating the instrument through the dummy urethra. Several blood-red irregular masses, made so as to resemble polypi, project from the wall, and one or two calculi and foreign bodies rest on the base. The ureteral orifices and vessels are marked.

Again, although we may become rapidly proficient in placing the light, it is far otherwise in the just appreciation of what is seen. A stone or needle encrusted with phosphates, or a typical growth, is as readily recognisable by a novice as are some well-marked conditions of the retina, tympanum, and larynx, when examined by means of the ophthalmoscope, otoscope, and laryngoscope.

There are, however, certain conditions of the mucous membrane which are at first exceedingly puzzling, and which require some experience to determine their nature. One of these pitfalls

consists in swollen mucous membrane, another in rugæ of the mucous membrane of the insufficiently dilated bladder simulating outgrowths from the wall. We shall have to allude to these and other fallacies in the following pages. Lastly, it is very difficult to appreciate the exact size of the object we examine. The size of the object as seen through the instrument varies according to the distance of the prism from it. If the prism be near, the object is magnified, and we are deceived as to its proportions ; if the prism be withdrawn, the opposite effect and error is induced.

It will be found that the cystoscope fails under three conditions :

1. It can rarely be passed without undue violence in patients the subjects of irregularly enlarged prostates, *i. e.* in which the prostatic canal is very devious, and blood becomes smeared on the window and mixed with the urine in the bladder. An ordinary enlarged prostate offers but little impediment to the introduction of the instrument, but it is impossible to examine the pouch behind the prostate if that depression is deep. Nor can the base be thoroughly searched if the intra-vesical prostatic outgrowth be large.

2. Stricture of the urethra of course offers an

impediment to the passage of the cystoscope. This obstruction can easily be removed by dilatation. It may happen, moreover, that in dilating the stricture to facilitate the introduction of the instrument we may remove the cause of the obscure symptoms which have suggested the electric light exploration of the bladder. If the meatus be small it can easily be cut inferiorly, under cocaine, to the proper size by a touch of a blunt-pointed bistoury.

3. If the urine contain blood or pus the wall cannot be distinctly made out, for the light seems to be placed in a red or yellow fog, and everything is obscure; this is, however, generally obviated by washing out the bladder and replacing the murky medium with clear water.

4. It will be found that the cystoscope is difficult to work in contracted bladders, or in those in which the capacity has been greatly diminished by pressure from without.*

5. Occasionally spasmodic contraction of the bladder (especially in cases of tuberculous or other ulceration) will not allow a sufficient amount of water to be tolerated. Cocaine or anæsthesia usually overcomes this difficulty.

* Compare author's case of sacculated stone, Chap. VII.

6. Certain deformities, such as an ankylosed hip, a rickety pelvis, or a kyphotic spine, will give the observer some difficulty in approaching the ocular end with his eye ; a little management of the head is needed in these cases to obtain a good view.

Summing these points up briefly, we may say that there are three conditions indispensable for the employment of the cystoscope.

1. The urethral canal must have a calibre of 22 French catheter gauge.

2. The bladder must have a capacity of at least four ounces.

3. The water in the bladder must be translucent and ought to be perfectly transparent.

Rules and Directions for the Use of the Cystoscope.

Before commencing to arrange the patient, it will save a good deal of annoyance if the lamp and battery are examined and proved to be in good working order. Connect the battery wires with the cystoscope, immerse the elements, keeping the rheostat at the point of greatest resistance ; and use the "kick-over" or key attached to the ocular end of the instrument to close the circuit. The

incandescent lamp will now burn a dull red. Gradually move the rheostat until the filament emits a bright, white light. The instrument is now ready. Open the circuit, withdraw the elements from the chrom-sulphuric acid fluid, and turn your attention to the patient.

This initial examination of the lamp is necessary, because after some time the carbon filament gets burnt and offers less and less resistance to the current, throwing out less and less light. By moving the rheostat to the proper point of resistance of the lamp we are able to depend upon the brightness of the light. The lamp may possibly require changing. It may have burnt through, and it is certainly annoying, if, after we have introduced the cystoscope and switched on the current to see no light at all. Nothing is easier in the Leiter instrument (page 41) than to replace it with another. But here a caution is necessary. No two lamps have exactly the same resistance, so that one lamp may burn brightly with the rheostat at maximum, its carbon filament offering but little resistance to the current; and another will only emit the necessary white light when the rheostat approaches zero, or the minimum. Hence, every lamp ought to be first gauged by the rheostat in the manner

just described. If this is not done, the operator will either fuse a number of lamps, or will only obtain a useless, dull, red light.

The slight operation of cystoscopy may be performed under cocaine (20 per cent.), or even without cocaine in practised hands. Presuming that no obstruction to the introduction of the instrument has been found in the urethra, such as stricture, meatal contraction or deviation of the prostatic canal, the patient is to be interrogated as to the amount of urine in the bladder. There is no transparent medium so perfect or so suitable as clear, healthy urine, and I always make a point of getting the patient to retain his urine, if it be free from blood and pus, as it not infrequently is in intermittent hæmaturia, so as to allow of at least five or six ounces being found in the bladder. Practically speaking, the more distended the bladder is, so much the easier is the examination of the base; but the apex will be out of sight if the bladder contains ten ounces or more.*

* It will be found that the varying positions of the individual parts of the bladder produced by different degrees of distension are at first a source of fallacy to the operator. This difficulty may easily be appreciated by introducing the cystoscope and searching for the ureteral orifices in the dead subject when the bladder contains ten ounces of water. Now draw off five ounces and repeat the search; it will be found that the positions of the

Should the patient have passed his urine lately, or should there be pus or blood in his urine, it is of course necessary to replace that medium with clear water. A soft Jacques catheter is passed, and the bladder is well washed out with a warm solution of boracic acid. After the washings become quite clear,* four or five ounces of the same solution or of clean and warm kettle† water are run into the bladder. A drachm or more of a 20 per cent. solution of cocaine may be injected through the same instrument, if this is required.

The cocaine rapidly diffuses itself throughout the water, and serves not only to deaden the sensibility of the vesical mucous membrane in spasmodic cases, but also to allow of a still larger introduction of the boracic solution, if a difficulty in tolerating the necessary quantity is experienced by the patient. An irritable bladder may thus be induced to accommodate as much as six ounces

ureters have changed. They may project as conical masses, or they may even be entirely concealed by the folds of the bladder.

* In some cases of nodular carcinoma no amount of washing will produce a clear medium, for the blood is as rapidly poured into the bladder as it is evacuated and replaced by water. It is best in these cases to postpone the examination until the urine clears.

† Plain warm water sometimes acts as an irritant to sensitive mucous membranes. Compare case of Mr. F— under heading of Hæmorrhagic Cystitis, Chap. VII.

without discomfort.* As the Jacques catheter is being withdrawn I sometimes squirt a little of a 20 per cent. solution of cocaine into the urethral canal, anæsthetising especially the prostatic section. No apprehension need be felt about the application of the cocaine.† It is of course much more satisfactory in difficult cases to have the patient anæsthetised, for, often in the middle of an examination of an irritable bladder without chloroform the patient is seized with an uncontrollable desire to pass water, and the medium has to be renewed if his wishes are acceded to.

In the greater number of my cases I have neither used anæsthesia nor cocaine. I employ the former (*a*) in young females for delicacy, (*b*) in tuberculosis or similar cases where the prostatic urethra is extremely sensitive, (*c*) when it is necessary to demonstrate some particular disease to a number of visitors, (*d*) or in order to make a leisurely prognosis of a discovered growth so as to determine the expediency of operating for its removal.

Usually the patient lies on his back with the trousers unbuttoned and thrown a little way down;

* Compare Chap. VIII for dangers of over-distension.

† I have used injections of the drug continually in large outpatient practice, and have *never* seen any case presenting symptoms of so-called cocaine poisoning.

a clean towel is placed across the trousers, upon which the right side of the observer's face can rest whilst he is looking down the cystoscope. Or if it is preferred the patient may lie on his back with his buttocks drawn to the edge of the table, with his legs bare and separated, the feet being supported upon chairs of suitable height. If an anæsthetic is used the lithotomy position is the best. The operator, being seated between the patient's thighs, now takes up the instrument, and either uses a drop or two of glycerine to smear its surface with, or tries to pass the elbow and a little of the shaft without any application whatever. A dab of vaseline at the meatus will now lubricate the rest of the shaft. This prevents murking the prism of the window. *It is of the greatest importance that the key or kick-over is not moved until the elbow is felt to have entered the bladder.* If this is not attended to the lamp may be set in action while it rests in the prostatic urethra, and that section of the canal is soon scorched by the heat of the hood.

On applying the eye to the ocular end of the instrument when the beak has been felt to have entered the vesical water and the key has been so turned as to close the circuit, the observer will

immediately perceive a yellowish-red glare at the end of the tube. With a little manipulation he will readily recognise the trabeculated surface of the bladder, and the minute vessels which ramify in the mucous membrane. If the medium be *quite transparent*, the vesical wall will be seen illuminated by a bright white light, and the details of the wall will be as clear as if they were viewed by direct sunlight.* After finishing the examination let the current be switched off so as to prevent the lamp being withdrawn, in full action, through the urethra.

Figs. 24 and 25 show the light thrown upon the floor and anterior wall of the bladder. They represent fairly well the direction of the rays emitted from the end of the instrument,† and they also demonstrate the use of the two forms of the cystoscope, viz. that in which the light is at the convexity of the beak (Fig. 24)—preferable for the floor and posterior wall; and that in which the

* It must be remembered that the brilliancy of the light and the success of the examination *depends upon the operator*.

1st. The lenses must be clean. 2nd. The lamp must have sufficient battery power to produce a steady white light. 3rd. The medium must be quite transparent and sufficient in quantity.

† In Figs. 21 and 22 the black area is incorrect; it is introduced for the sake of contrast. The entire bladder is lighted up more or less.

light is situated at the concavity (Fig. 25), and applicable for the anterior wall and sides. Practically, however, it will be found that the latter is

FIG. 24.

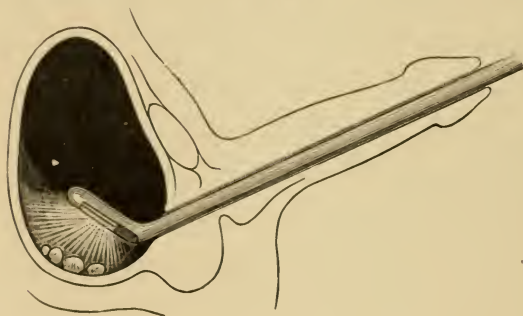
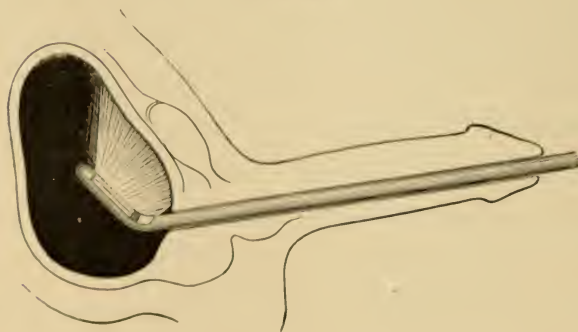


FIG. 25.



the more useful instrument, for it can be turned completely over in the bladder to survey the base, and also the posterior wall.

I have never yet had occasion to use the poste-

rior wall cystoscope, for the anterior wall instrument enables me to examine all parts of the bladder.

Brief Rules.

In starting an examination let the operator commence with the instrument shown in Fig. 25, and bear in mind the following golden rules :

1. See that the bladder contains at least six ounces of *clear* fluid.

2. Regulate the lamp beforehand, and do not start the lamp until the elbow is well within the bladder.

3. Do not *keep the cap in contact with the wall*.

4. Let the manipulation be gentle and purposive.

5. Let the instrument remain half a minute in the bladder after the current has been shut off in order to *completely cool the hood before you withdraw*.

6. Let the base of the bladder be examined first; for the inferior zone of the bladder is to vesical endoscopy what the optic disc is to ophthalmoscopy,—the most important area in the examination. It is to the inferior zone that the cystoscope is first directed, for it is this section

of the bladder which contains or conceals for the most part those diseases which rank as "obscure." Thus calculi—free, latent, or sacculated; foreign bodies (other than stones); growths—malignant or benign; ulcerations; and even pouches are all more common in the inferior zone than in the middle or superior.

The principal points in the inferior zone are the ureteral orifices.* I never feel quite safe in a

* Short note concerning the location of *single* tumours found in the museums of Great Britain.

Villous papilloma (author, 'Path. Trans.,' 1888).

Conclusions—1. Growths that are single are generally found in the inferior zone (86 per cent.).

2. They spring from the *margins* of the trigone.

3. They are found at the right ureteral orifice in 43 per cent., at the left ureteral orifice in 26 per cent., and on the interureteral bar in 10 per cent. of the cases.

4. They are generally pedunculated or tend to become pedunculated in the proportion of 2 : 1 (43 per cent. are pedunculated, 20 per cent. are subsessile, 33 per cent. are sessile).

Fibromata.—90 per cent. are at the ureteral orifices.

Sarcoma (author, *ibid.*).—Sarcoma of the adults. The trigone is rarely the site of the disease. The favourite spot is the posterior wall, either just behind the right or the left ureteral orifice. They are usually sessile (10 per cent. possessed pedicles).

Carcinoma (author, *ibid.*).—The right and left ureteral orifices are rarely the origin of carcinoma, though of course they may, and generally do, become implicated by extension. The posterior wall in the middle zone is the part most often affected, *i. e.* 63 per cent.; next to this comes the trigone itself, 20 per cent.

As regards the liability of the three zones to become affected by SINGLE cancerous growths the following statistics are of

cystoscopic examination unless I have clearly seen these openings and their immediate neighbourhood. (*Vide* p. 82.)

The Normal Bladder as seen by the Electric Cystoscope.

Before entering upon the description of the appearances of the pathological conditions of the urinary bladder, it will be as well to give a short sketch of the aspect of the mucous membrane of the healthy viscus. It will be found that the slight differences which do exist in the arrangement of the vessel-branches and muscle-bundles in the normal bladder are immaterial, and any healthy man of twenty-five will afford a good standard for comparison with abnormal deviations.

The mucous membrane of the healthy living bladder appears, under the electric light, of a reddish-yellow or light straw colour. Its surface, importance to the cystoscopist. They are estimated from 100 cases of carcinoma vesicæ examined by the author :

Upper zone	7·2 per cent.
Upper and middle zone	7·2 „
Middle zone	22·5 „
Middle and lower zone	17·5 „
Lower zone	42·5 „

The upper : middle : lower zone :: 1 : 3 : 6 as regards liability to carcinoma,

although covered with water, is bright and glistening. Coursing here and there are a few sparsely scattered arborescent vessels, which issue at unfixed points, and run their course, dividing and subdividing apparently without anastomosis with other trunklets. These vessels are of varied tints. Some are thicker, and are evidently venous branchlets; others possess a more arterial hue. The retinal appearance of the healthy mucous membrane will be at once remarked. The questions have often arisen in my mind why large areas should appear to be so apparently destitute of vessels? and what has called the isolated systems that are seen into a visual existence?

Depressing the handle of the cystoscope (Fig. 25) we examine the anterior wall, and perceive projecting, in ill-defined longitudinal bundles, the fasciculi of the so-called detrusor urinæ muscle. This condition is more marked towards the posterior surface, for there the bundles interlace, and form an intricate trellis-work-like mesh of greater or lesser delicacy. Between the lattice-bands are slight depressions, pits, or dimples—the precursors of the herniæ of disease. The cystoscope disposes of the belief that this trabeculated condition is only observable in the pathological

bladder. The elements are nearly always present, and need but the exaggeration of increased functional activity to produce the columniform bladder with its accompanying diverticula.

Attached to the mucous membrane will be seen, perhaps, a small, glistening, glass-like globe, reflecting the incandescent lamp upon its convex surface. It oscillates at every movement of the instrument or at every jerk given to the patient's pelvis. It is an air-bubble introduced with the catheter or injection, puzzling the uninitiated as to its cause and character, but bearing with it a fruitful lesson for care in the prophylaxis of urinary or so-called catheter fever.*

By depressing the handle of the cystoscope, and rotating it completely on its long axis, the window and the lamp can be made to overlook and lighten up the base. In a healthy bladder the trigone forms a very beautiful object, reminding one of a sandy shore, so even and yellow is its surface. More posteriorly, and at the angles, are placed the orifices of the ureters situated upon elongated oval-shaped projections. If the

* Author, "Precautions to be Adopted in the Removal of Residual Urine." 'Trans. of the West Lond. Medico-Chir Society,' vol. ii, p. 101,

bladder is healthy and full of clear urine there will be no difficulty in discovering their slit-like openings. Sometimes the lips are rather thick and pouting—a condition which, if not exaggerated, is not incompatible with perfect health. If one of these orifices be watched carefully the curious phenomenon of efflux will be seen.* The little slit will suddenly gape and a tiny swirl of fluid will be emitted. Should blood be present in the ureter the effect is heightened, and the appearance of the jet of bloody urine issuing from the mouth of the canal reminds one of a miniature cuttle-fish squirting out its inky fluid into the surrounding water.†

* Ureteral contraction passes from above downwards (from the renal pelvis to the bladder) at the rate of 20—30 mm. a second, the adjoining bladder wall apparently participating in the wave (Stansky). The evacuation takes place every three quarters of a minute (Mulder). Dr. A. J. Zamskin (*Eyedelnaia klinisches kaia Gazeta*, No. 1, 1887, p. 13) has worked at the subject of ureteral efflux in a Finnish woman, aged forty-two, who had an extensive recto-vesico-vaginal fistula. Both orifices were exposed. Nine observations were made each lasting an hour. It was found that the contractions of the orifices were rarely synchronous, and that they did not contract equally as regards number. I have been able to watch and time the efflux in an ectopian vesical case sent to me for operation by Mr. Heycock. The rapidity of efflux in some cases appears to depend upon a pathological stimulus (*vide* p. 96).

† Author, "The Value of Inspecting the Orifices of the

Not infrequently the observer will notice a rhythmic contraction in the ureteral orifice and the surrounding bladder wall. Should the orifice be projecting inwards as a cone, the apex of the body will alternately recede and protrude.

The ureters are sometimes indiscoverable, and no amount of skilful rotation or manipulation of the instrument will bring them into view.

Let the operator remove his cystoscope and inject a little more water. This manœuvre not infrequently produces the desired effect, for in an insufficiently dilated bladder the mucous membrane forms folds which overlap and conceal the orifices most effectually. Sometimes a ureter is displaced* by disease, only rarely is it absent.†

The urethral orifice can be thoroughly searched by withdrawing the cystoscope until the window is at the opening of the bladder. It is seen as a crescentic fold, blood-red in colour from the transmission of the rays of light through its vascular substance. It is not usually a sharp-edged

Ureters by Electric Light," 'Brit. Med. Journ.,' June 16th, 1888.

* Author, "Case of Tubercular Exfoliating Cystitis," 'Path. Trans.,' vol. xxxvii, p. 310.

† Author, "Atresia (Congenital?) of the Vesical Orifice of the Left Ureter," *ibid.*, p. 300.

fold, being more generally rounded. By rotating the instrument every part of the circle can be examined.

The cystoscope, moreover, demonstrates very clearly in the undilated bladder the rugæ of the mucous membrane. The thick folds of mucous membrane stand out into the cavity of the viscus as large projecting ridges. It is easy enough to thrust the incandescent lamp between these rugæ. The lamp being thus enveloped its light is so diminished as to be rendered useless, and the concealing folds are in danger of being burnt or injured by the prolonged contact.

CHAPTER V.

PHOTOGRAPHY, AND CLAY OR WAX MODELLING OF
THE LIVING BLADDER.

THE changes in the aspect of the mucous membrane of the bladder, produced by relaxation, congestion, or infiltration are so varied and often so remarkable, that it is only by systematically accumulating a record of these appearances that a sure basis for establishing a sound diagnosis, prognosis, and treatment of vesical disease upon visual grounds can be acquired.

Drawings in pencil, pen, or colour are most valuable if carefully taken, but they are never *true* representations, nor do they convey to others an exact idea of the disease they attempt to depict. The reasons for this are obvious. The cystoscopic field from which the artist draws is small, and the area to be portrayed is often large ; hence a number of drawings is generally necessary to represent the disease in its entirety. Again, the cystoscopic

field changes with the slightest movement of the patient or the operator. Even a cough, a deep inspiration, or a slight involuntary vesical contraction is sufficient to puzzle a non-professional artist by suddenly displacing or distorting some salient feature which he may have taken as a "fixed point." Moreover, if bleeding should occur before the painting or drawing is completed, the transparent medium has to be renewed, and it is often difficult so to redistend the bladder as to obtain the same view of the object as before.

The *ne plus ultra* of cystoscopic delineation would be instantaneous photography with an instrument like the kodak, which would take, by means of an electric contact shutter, a series of "snap shots" of the interior of the viscus by merely turning the cystoscope in various directions. It would seem easy enough, if the electric light can be introduced into a hollow viscus, to photograph the contents of the cavity, but at present certain mechanical obstacles in the living bladder form almost insuperable barriers to such a method being successful and practical. Many of the growths are actinic in colour, and the inflamed mucous membrane does not give a sufficient contrast to act as a good background. Not only do the indi-

Photo-Print 2.



UNTOUCHED CYSTOSCOPIC PHOTOGRAPH OF A POLYPUS (L)
IN THE DUMMY BLADDER.

Photo-Print 3.



UNTOUCHED CYSTOSCOPIC PHOTOGRAPH OF A POLYPUS
IN THE DEAD BLADDER.

vidual fringes or surface components of the growth sway freely about in the tiny currents produced by the heat of the lamp or the respiratory movements of the patient, but every few seconds a rush of urine from the ureter churns up the floating particles which settle towards the base, and sweeps the *débris* right across the field of the prism.

Mr. Pearson-Cooper (of the London Camera Club) and I, have been able, after much expenditure of time and trouble, to obtain good negatives of artificial growths both in the dummy (Photo. 2) and the dead bladder (Photo. 3). The *living* bladder has also been photographed, but the negatives are too indistinct* for any practical use. These photographs were taken by means of an ordinary cystoscope fitted with a special apparatus. These photographs of growths in the dead and dummy bladders are "*untouched*." They will serve to

* Compare also Geza von Antal, 'Internationales Centralblatt für die Physiologie der Harn und Sexual Organe,' Bd. i, Heft 1, p. 18. Prof. Antal's photograph of the living bladder is a failure, both as regards size and detail. Although obtained with almost every advantage—a woman's bladder, a good light, a lens system of Terrestier's, a black hair-pin standing out in bold relief against the mucous membrane, his picture only shows *one* dark indistinct shadow obliquely crossing an area the size of a pearl shirt-button.

show the reader that we have mastered many of the difficulties of the undertaking, and that our expectations of making a practical camera for obtaining faithful negatives of the mucous membrane of the living viscus in health and disease are neither Utopian nor unfounded. But, until we are able to thus graphically record the many new and interesting clinical facts which the electric cystoscope is constantly revealing, I wish to advocate a substitute which I have employed for some time, and with considerable advantage. I refer to modelling in some plastic material the interior of the living bladder as it appears illuminated by electric light.* The plan I have lately adopted of making clay or wax models of the diseased living bladder is similar to that which I recommended at last year's Surgical Congress† in Berlin, for recording the changes of shape in the living prostate.‡ It is easily carried out, and only needs a small bowl or its shape-equivalent, a little oil, a penknife, and a handful of sculptor's clay.

* Author, "Clay and Wax Modelling of the Living Urinary Bladder under Electric Light," 'British Medical Journal,' Jan. 5th, 1889.

† "Ueber Thonabdrücke der Prostata am Lebenden," Langenbeck's 'Archiv,' Bd. xxxvi, Heft 2.

‡ 'British Medical Journal,' May, 1887.

As an example, suppose we wish to retain a record of an epithelioma of the bladder in an early stage. The clay is dropped into the bowl, and flattened out into a thick layer. A concave surface is thus formed, which will roughly represent the interior of the bladder. A little oil previously smeared over the inside of the bowl will permit the model to be subsequently turned out after drying. The bladder is now carefully examined in all parts by electric light, and the diseased section localised. Each part of the tumour is next observed, its size and the character of its surface appreciated. The light is switched off, and the handle of the cystoscope given to the patient or the assistant to hold, or it may be laid on a scrotal cushion. A fresh piece of clay, the size of the tumour, is taken and roughly modelled to the shape of the growth. The light is again turned on, and the tumour re-examined. With a little trimming by means of the knife and fingers, the clay shape is made to assume the form of the growth. It is finally stuck on to the concave clay in the bowl, its position being easily marked by pricking two slits to represent the orifices of the ureters.

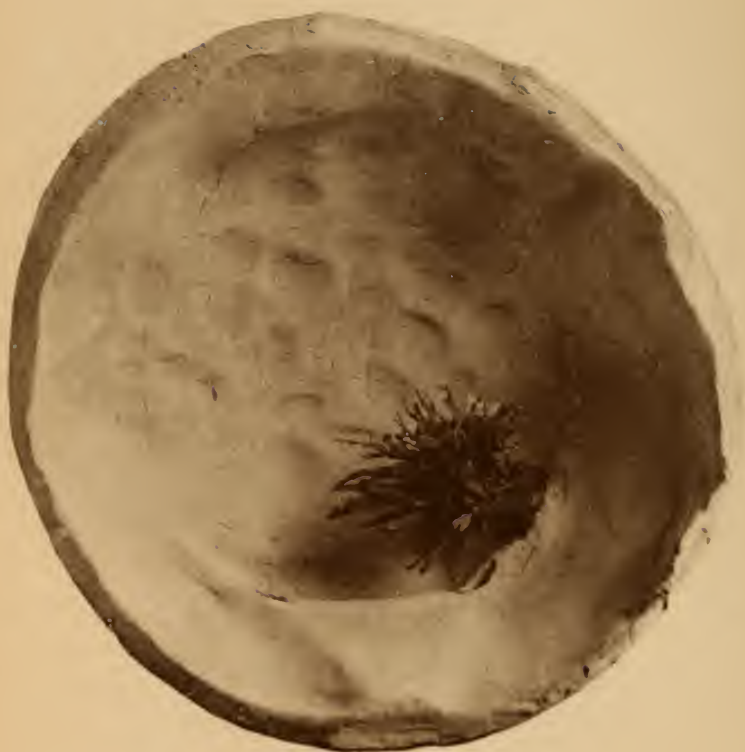
Fig. 26 is a photograph of a clay model which was taken of the bladder of a patient suffering

from carcinoma of that viscus. The case was sent to me in April last by Dr. de Gruyther, at the suggestion of Dr. Carmalt Jones, with the diagnosis of vesical growth. On examining the bladder with electric light, a smooth, multilobed,

FIG. 26.



malignant growth was seen projecting from the posterior wall a little above the interureteral bar. A rough sketch of its position and size, with a note to the effect that the tumour was invading



VILLOUS PAPILLOMA OVERHANGING LEFT URETER.
(CLAY AND WAX MODEL.)

the gut, and that operative interference was useless, was sent back with the patient. A clay model was subsequently made and photographed. The patient was admitted into, and died in, the Cancer Hospital in September. On post-mortem examination the position and invasive character of the growth were verified. The clay model and the specimen now give a rough but valuable indication of the rate of growth of the tumour during the last five months of the man's life (compare p. 185).

The delicate "villous tumour" (papillary fibroma) is most difficult to represent in clay, but it will be found that the villous processes can easily be modelled in appropriately coloured wax or ordinary dental wax. The second photograph (Photo. 4) was taken from the wax model of such a case. The patient was brought by Dr. Harle, of Hackney, with painless hæmaturia and a diagnosis of probable vesical growth. A very beautiful "primrose-leaf" villous-surfaced tumour was seen attached to the upper lip of the left ureteral orifice, its long individual leaves swaying apart at each jet of urine propelled from the subjacent opening. Some of the leaves were whitish from loss of blood-supply. Its pedicle appeared to be succulent and epitheliomatous. The patient

was leaving for Australia in less than two days and a half, but he was able to take with him a photograph which will afford the surgeon he next applies to a sufficient representation of the position of the disease he is called upon to treat.

Besides the value of thus keeping a record of vesical disease, or of sending a photograph or model to the practitioner in charge of the case, there is a still greater benefit to be derived from modelling vesical growths. The mere attention which the manipulation involves calls forth the observation and the recognition of those minute differences upon which *prognosis and treatment* must depend, for it cannot be too strongly insisted upon that the electric cystoscope ought not only to be an efficient aid to diagnosis, but ought also to assume the higher position of a prognostic agent which may deter the surgeon from needless interference, or may indicate to him the form of operation best suited for the removal of the growth in question.

CHAPTER VI.

THE VISUAL FALLACIES OF ELECTRIC CYSTOSCOPY.

I HAVE already* urged the paramount necessity for unremitting practice with the electric cystoscope, if any degree of accuracy in visual diagnosis and prognosis of obscure bladder disease is aimed at, in order to enable the observer to avoid the many pitfalls which the mucous membrane of the bladder presents both in health and disease under the electric light. It is perfectly true that a novice may recognise a typical growth or a glistening stone without difficulty, but it is also equally true that the inexperienced cystoscopist will be readily and more often deceived by the perplexing appearances which the mucous membrane is wont to assume under the varying conditions of relaxation, congestion, extravasation, and infiltration, and may be tempted to interfere, operatively, to his own and the patient's detriment,

* Compare Chapter IV.

under the belief that he has to deal with a growth, when no such morbid condition is present. I have already seen such a mistake happen twice, so that it will be as well to draw especial attention to those conditions which are most likely to prove deceptive. Visual fallacies in electric cystoscopy may be grouped under two headings: 1. Those encountered in the healthy bladder; 2. Those met with in the diseased bladder.

1. The healthy bladder.

(a) *The Uretéral Cone*.—The first normal pitfall to be avoided is a protuberant or a slightly prolapsed ureteral orifice. The vesical opening of the ureter usually appears as a pouting, thick-lipped orifice, but even in perfect health it may be seen as a red, gelatinous-looking cone, more or less obtruncated. It is then very like a small sessile tumour; in fact, in one case of hæmorrhagic cystitis, I had some difficulty in dissuading the surgeon who had “discovered” a very projecting ureteral cone from operating in order to remove it. The similarity is much increased by the magnifying power which the prism possesses. The cause for this appearance is most probably to be found in the adherence of the mucous membrane to the trigone, and the laxity of the same in

other parts of the bladder. When the bladder is only partially expanded the mucous membrane becomes rolled or heaped up at the fixed points, such as the orifices of the ureters and the urethra. Or it may be a slight but definite prolapse of the mucous membrane of the ureter into the bladder*

* If the prolapse exceeds these limits it may advance into the vesical cavity so far as to form rounded tumours of varying sizes, cf. St. Bartholomew's Hospital Museum, No. 2367; 'Path. Trans.,' vol. xiv, 1863, p. 185. Or in female children it may even protrude through the vulva, and tempt the surgeon to ligate it with lethal effect, under the belief that it is a vesical growth.

CASE A ('Path. Trans.,' vol. xxx, 1879, p. 310).—F. W—, æt. 18, under Mr. Davies-Colley. A soft mass of a dingy reddish-purple colour, about one inch long and half an inch thick, was seen protruding from the vulva. The child had been lately noticed to strain a good deal on making water. "The flaccid reddish protrusion was readily unfolded, and ascertained to be the shape of a funnel, the neck of which was placed within the urethra. The aperture of the funnel formed a circle one and a quarter inches in diameter; its neck, which lay within the urethra, was not quite half an inch in diameter, but when it was not upon the stretch, it shrank to so small a size that it did not fill up the whole of the urethra, which was not unusually large. The edge of the funnel was about an inch distant from the meatus urinarius, except posteriorly, where there was an interval of half to two-thirds of an inch. The walls of the funnel were nearly a quarter of an inch thick, soft, shining, and of a reddish-purple colour, and resembled in appearance congested omentum. A probe could be passed into the bladder through the meatus, and could then be moved nearly all round the neck of the funnel, but not quite, from which it appeared that a part of the funnel grew from the posterior wall of the urethra. The little finger was introduced into the vagina, and the os uteri could be felt in its normal position. A female

—a condition which I have most frequently seen in cases of pyelitis or renal stone—cases in which the ureter has been seen to be energetically contracting, presumably under the influence of the abnormal stimulus set up by some ulceration or foreign body in the ureter or the pelvis of the kidney. To recognise the ureteral cone, the cystoscopist notes that its position corresponds to the postero-external angle of the trigone; that the summit is slightly flattened, depressed, and occupied by a small orifice, whence tiny jets of glycerine-like fluid issue at varying intervals; and,

catheter was next passed into the funnel. It went up about five inches towards the left side of the abdominal cavity, and gave exit to four or five ounces of very fetid pus. The catheter was introduced into the urethra, and drew off about two ounces of clear, inodorous urine. The neck of the protrusion was ligatured, and the mass cut off. The child died nine days after. Autopsy revealed that the mucous membrane which surrounded the orifice of the left ureter had prolapsed, probably under the combined influence of a renal calculus and great straining, and had been ligated and removed.

CASE A.—Caillé's case is still more important. It is described in the '*Inter. Journ. Med. Sciences*,' May, 1888, p. 481. A prolapse of the inverted lower third of the right ureter through the urethra of a female child two weeks old was discovered after a severe fit of crying. This prolapse was apparently owing to the formation of a warty or a papillomatous growth the size of a pea in the right ureter near its vesical insertion. The protrusion was ligatured, and the child died twelve hours after. Extensive renal disease was discovered on post-mortem.

moreover, that the apex not infrequently protrudes and recedes rhythmically.

CASE 1.—Mr. R. Mc—, æt. 22, consulted me on account of his passing large quantities of urates, with considerable disturbance of health. He suffered much pain in the back and burning pain in the testicles, and stated that he experienced a difficulty in finishing making water. Cystoscopically the mucous membrane of the bladder appeared to be glazed and cracked; the left ureter projected into the bladder like a turgid mammary nipple, the apex protruding and receding at each efflux of urine from its mouth. The right ureter appeared normal.

CASE 2.—Mr. W—, æt. 54, a patient of Dr. Warner, of Woodford, two years ago was suddenly seized with left nephritic colic, since which time he has only had two bad attacks. He is troubled, however, with a continual pain in the left side, which he can cover with two fingers. “The left ureteral cone protrudes, the efflux is rapidly repeated, but feeble and murky. The right orifice is flattened. The bladder is healthy, a deepish post-prostatic pouch is present, no stone is in it.” The knowledge of this pouch permitted me to warn Mr. W— of the chance of it forming a trap for any stone entering the bladder after a severe attack of colic. Pieces of stone ultimately came away, and the pain was almost entirely relieved by the exhibition of alkalies.

(b) *Rugæ*.—The healthy, lissom, inelastic mucous membrane, when folded in by the contracting muscle tunics, forms creases, plaits, and wrinkles, which are sometimes caught sight of in profile, and which then appear like rows of papillomata. By turning the prism so as to full-face them, the deception is detected. When these *rugæ* are inflamed or swollen, their appearance is still more puzzling (*vide* p. 99).

(c) *Deposit upon the Walls.*—It may happen to others, as it has to me, that instead of washing out the bladder, I have taken the patient's word for it that the urine is quite clear, and on introducing the cystoscope have found the water murky with phosphates or urates. In other cases I have seen the surface of the bladder powdered over with such deposits, and the water quite transparent, a condition which is apt to deceive one into the belief that the mucous membrane is blurred with inflammation. A similar state of urine exists sometimes in tuberculosis of the bladder. The prism here appears to be immersed in water, in which are floating multitudes of small, roundish, whitish bodies, very similar to a sweetmeat known to children as "hundreds and thousands." Whether these particles are the shavings out of innumerable small ulcers or not I am unable to say, but I have generally noticed them in cases of tuberculous ulceration.

(d) A more puzzling and important deposit is that of blood. A thin adherent layer of renal blood or a deposit of altered blood will completely change the appearance of an otherwise healthy mucous membrane, deluding the observer into the belief that he has to deal with an old-stand-

ing cystitis, with congestion of the mucous membrane.

(e) *Mucus*.—Ropes and streamers of mucus in the healthy bladder are easily recognisable, but when cystitis is present and much grit or phosphatic powdering is intermixed with the mucus, it not infrequently increases the apparent size of a growth, stone, or ulcer, or conceals the true character of a stone.

2. The diseased bladder.

(a) *Rugæ*.—Not infrequently in hæmorrhagic cystitis, or in localised acute cystitis, parallel rows of purple or blood-red rugæ are seen, and these if caught sight of in profile resemble villous papillomatous processes very markedly. This condition and fallacy are very well illustrated by the following remarkable case, for the notes of which I am indebted to Dr. Houston Davson and to Dr. W. D. Waterhouse, under whose joint care the lady came.

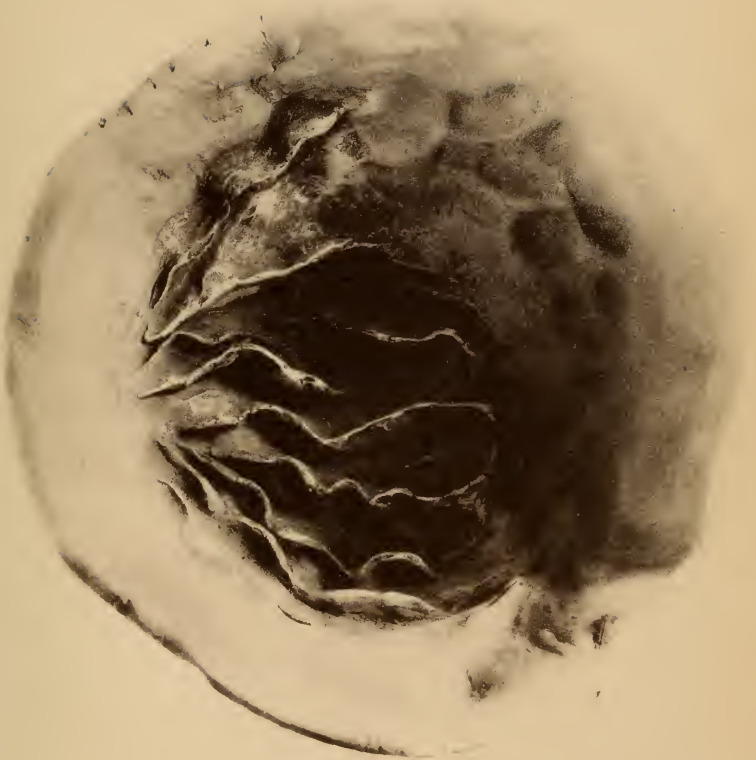
CASE 3.—Mrs. H—, a native of Demarara, æt. about 40, married, has suffered from frequent slight attacks of ague, otherwise her general health has been good. She was seen in the last week May, 1888, by Dr. Waterhouse for an attack of vaginitis, which got nearly well in a week, but which was followed by general abdominal pain. There was constipation, the motions being hard and covered with blood-stained mucus. There was also œdema of the anus. Two days afterwards she suffered from an

attack of biliary colic, with intense paroxysmal pain, nausea, and slight jaundice. The liver was enlarged and tender. No gall-stones were discovered in the motions; the urine contained bile. Hardly had this attack subsided before intense pain was experienced in the right kidney. Blood appeared in the urine, and from time to time it was very profuse in its amount. At times, however, the urine was quite clear; sp. gr. 1025; no albumen, pus, mucus, or sugar; neutral. The pain in the right kidney could be traced by the patient in the course of a day or two along the right ureter to the bladder. Finally the bladder became involved, and each act of micturition was attended with the greatest agony, opiates being indispensable in one form or another.

As these distressing symptoms continued for over a fortnight, a physician was called into consultation, and the diagnosis of right renal calculus was made. As it seemed probable, from the extreme frequency and pain in micturition, that the stone had descended into the bladder, I was asked to examine with the electric light and deal with the stone. My notes of the case run as follows:

"The onset symptom was five weeks ago. The patient has a number of sisters, all of whom have had tumours or cysts of the ovary. There is much blood (of vesical origin) in the urine, but the stream is never suddenly stopped as if by the corkage of the urethral orifice by a stone. All the symptoms are those of renal stone entering the bladder, but the vesical symptoms are far in excess of any which could be excited by a small renal concretion in a healthy bladder. They are more likely those induced by an acute inflammation of the ureter bursting upon the bladder."

On introducing the cystoscope and turning it towards the right side of the bladder, the following extraordinary appearance presented itself: Starting from a point a little above the right ureteral orifice, and running nearly parallel with each other, were innumerable upraised plicæ of a deep blood-red colour, the mucous membrane between the ridges being of a bright crimson. The colour faded towards the mid line into a perfectly healthy, glistening, and expanded mucous membrane lining the left side of the bladder (Photo print 5).



LOCALISED INJECTION AND INFLAMMATION OF RUGÆ.
(CLAY MODEL.)



“The thick blood-red plaits or rugæ of mucous membrane were evidently the expression of an intense inflammation which had broken in upon the bladder from the right ureteral orifice and had expended its force upon the adjoining area. Unless I had seen this condition, which Drs. Davson and Waterhouse corroborated, I could not have believed it possible that one half of the bladder could be perfectly healthy and fully distended whilst the other was contracted and its mucous membrane crumpled and turgid with inflammatory exudation and extravasated blood. The bladder must when distended with water have had somewhat the shape of a cottage loaf on its side. No stone was present. The right ureteral orifice was deeply buried in an elevation of swollen mucous membrane. My diagnosis was that the right renal pelvis had, either from contiguity to the liver or sympathy with it, become affected with precisely the same acute inflammatory changes, probably malarial, as the vagina, the gut, and the gall-duct. I also argued that as the mucous membrane of the bladder on the left side was now healthy and showed no trace of infiltration or hæmorrhage, notwithstanding the rapidity with which the bladder had been affected a fortnight previously, the disease was at a standstill, and was most probably subsiding. Alkalies, and subsequently quinine, were ordered. The patient began immediately to mend,—not, I believe, due to the change of medicine, but rather because the violence of the attack had expended itself, as indicated by the cystoscope,—the paroxysms of pain diminished, the blood disappeared, and the patient was convalescent in ten days. She has since remained well.”

(b) *Polyhedral or Rectangular Quiltings of Chronic Cystitis*.—Instead of the mucous membrane becoming raised in parallel rows, it not infrequently takes other and less easily recognisable forms. In proportion as it becomes swollen and gelatinous in certain forms of chronic cystitis, so does it form lumpy projecting swellings in the

semi-distended bladder. The appearances these present are of course protean; but the most common is that of polyhedral or rectangular quiltings, the swollen and almost translucent tissue enclosed between the depressed seams or puckers being thrust forward as globose or polypoid bodies, not unlike the myxomata of children. This condition is best marked on the posterior wall.

CASE 4.—C—, male, under Dr. Sutton. Had lithotripsy performed thirteen years ago; no trouble until three months ago, when he began to suffer from irritability of the bladder, the calls for micturition being every twenty minutes. He has pain, but not very severe in character, at the tip of the penis and suprapubically. He has never seen blood in the urine, the water is mucopurulent. Prostate hard and small, base of bladder posteriorly feels thick. The bladder capacity is four ounces. There were washed out many small rolled flakes (mouse droppings); no stone. Cystoscopy: "The bladder is free from growth, the trigone is puffy with congestion, the posterior wall is unnaturally white and gelatinous; it is crumbled and rucked up into œdematous projections with deeply cut intervening furrows. There is a deepish post-trigonal depression." The patient got rapidly better.

Again, these projections may be massed together, and of such uneven lengths and varied shapes that they resemble most strongly a group or patch of gelatinous polypi.

Lastly, they may be mere conical or blunt-topped protuberances of a more or less permanent

character, which I have most often noticed near the base, and of which the following cases are examples :

CASE 5.—Mrs. U—, æt. 32. In April, 1888, after six weeks of causeless ill-health and languor, she passed one evening without any warning bloody urine of a bright red colour. She had had no previous frequency of micturition, nor had she suffered any pain anywhere; had she not happened to have noticed the blood in the chamber she would not have known of its occurrence. Fourteen days after the onset she consulted me. The urine was then translucent and of a rosy red, intimately intermixed character. The hæmaturia was intermittent, usually appearing every evening towards five or six o'clock, though sometimes it was noticed throughout the day. Usually a cold shiver runs through her a few hours before the blood appears. On examining with the cystoscope the bladder was found to be perfectly healthy and the bleeding to be renal, but at the base I noticed a condition of mucous membrane I had not met with before, and which I noted as follows :

“The mucous membrane of the base is whitish and looks oedematous; the surface is covered with innumerable rows of stunted, conical elevations, which remind one of a preparation of a male bladder in St. Thomas's Hospital Museum, B.B. 25. In which specimen the mucous membrane is very thick and dense, and a number of stunted, brown-tipped elevations are sparsely scattered over the posterior wall. These ‘wart-like papillæ’ are one eighth of an inch long, and stand out stiff, like the spines on the surface of a prickly pear.”

A few doses of ergot and ammonia checked the hæmorrhage for a year, and I saw nothing further of my patient. She caught cold in May, 1889, and returned for treatment of a precisely similar attack. I seized the opportunity of re-examining

the bladder with a cystoscope, and found it quite unchanged. The same stunted conical projections are visible, scattered over the trigone ; the patient does not suffer from either pain or frequency. In this case we have a permanent condition, compatible apparently with perfect health, and yet this condition has to be separated from that in which an œdematous mucous membrane is rucked up into blunt-topped projections of a transient and pathological nature, which can be illustrated by the following case, given in the patient's own words :

CASE 6.—Mr. C. A. B—, under the care of Dr. Bull, of Chislehurst.

“ Five years ago pain came on in the side like the stitch. This was followed by pains in the penis on commencing and finishing passing water. I was then sounded, with a negative result. I was recommended to St. George's, and was there again sounded under ether, and remained there six weeks. I returned home and went back to work (builder's foreman) for twelve months, when one day I was seized with an attack of retention. After a drink of gin, and much straining and great pain at the tip of the penis, I succeeded in relieving myself. For some time after this the pain in the penis was very severe on commencing and finishing making water. I then consulted Dr. Bull, who, after relieving me somewhat, sent me to Guy's Hospital. I remained there about a month, and was sounded for stone with negative result. Since this time I have had several stoppages, and I was always passing water at short intervals night and day to get a little relief. I was provided with a catheter, which I now always carry with me in case of stoppages.”

Dr. Bull kindly referred the patient to me in October, 1888.

It will be seen that, with the exception of the absence of blood, all the symptoms characteristic of stone were present. There was slight renal pain, followed subsequently by pain in making and finishing water, repeated stoppages and strainings to overcome some obstacle, with increasing frequency. Prostate free.

On entering the bladder with the electric cystoscope I was struck with the great œdema of the mucous membrane at the base and around the urethral orifice. The whole surface of the trigone was raised into white gelatinous projections like foetal finger-tips placed side by side. No stone or growth existed. Upon what did this œdema depend? I was unable to say, but, practically, he had an œdematous obstruction at the orifice of the urethra which interfered with micturition and generated symptoms of stone. Under appropriate treatment he rapidly recovered, and wrote under date November 27th, 1888, "Feel very well; quite free from pain."

To a slovenly, careless cystoscopist there is yet another disease which resembles at first sight this foetal finger-tip condition of the base. I allude to dilated mucous glands or to vesicular inflammation.* Such cases can be only very seldom met

* At the Pathological Society, on May 7th, 1889, Mr. Silcock showed a specimen of *vesiculation of the vesical mucous membrane*, in which the vesicles were situated in the bladder and right ureter. They varied in size from that of a pin's head to a small shot, and were especially numerous over the trigone. In the fresh state they were filled with a blood-stained serous-like fluid. Examined microscopically, the vesicles appeared to commence in small foci of leucocytes or young epidermal cells which had undergone disintegration. The walls of the vesicles were formed by epithelium cells. There were no inflammatory changes in the submucosa. The specimen was taken from the body of a man who had died in St. Mary's Hospital after the operation of nephrectomy. There was a calculus in the lower end of the right ureter, which was much dilated and hypertrophied. The left

with, for they are rare even on the post-mortem table. They appear as small round translucent bladders or vesicles, and are usually placed upon the trigone. I have only seen one case of the kind with the cystoscope.

CASE 7.—Mr. A—, æt. 37, was brought to me for examination by Dr. Hill Gibson. He was passing mucoid urine and blood. His history was as follows:—The patient, whose family history is good, is a powerful and active man, and has enjoyed good health up to 1884. In March, 1884, he suddenly remarked the presence of blood in his urine. There was no pain or frequency. The colour of the water was sometimes rosy, sometimes brown, or even jet black. The depth seemed to be increased by exercise, the blood was always intimately mixed. He was seen by various men, who diagnosed renal disease, and the bleeding ceased entirely after taking rest. From June 18th, 1884, until September, 1886, he had no recurrence. At this latter date, however, the bleeding returned, and ceased as before on taking rest, until the spring of 1887, when it recurred for one night on taking four glasses of port wine. The end of April, 1888, the hæmaturia again recurred, and continued until November 26th, 1888, when it gradually ceased. In March, 1889, the blood again reappeared, and it was present when I examined him on April 24th.

On cystoscopy the water washings flowed out freely and quite kidney and ureter were normal. The urine, examined immediately before the operation, was acid, of specific gravity 1013, but previously it had contained much pus. Mr. Silcock quoted Rokitsansky. (Cf. Coupland's case, Morris, 'Surgical Diseases of the Kidney,' pl. iii.) Also *psorospermial cysts of the urinary tract*, a case of which was sent me by Dr. J. Arnold Jones, of Aberavon, and exhibited at the Pathological Society by Mr. Eve. The cysts were miliary in character, and full of colloid material. The specimen was removed from a woman, æt. 51, who died after seventeen days' profuse hæmaturia ('Brit. Med. Journ.,' p. 1173 May 25th, 1889).

clear. The bladder was free from growth or ulceration. The bleeding seemed to be coming from the right ureter, for it got quickly murky at the right side, though no distinct jetting was seen as in other cases (compare p. 192). The trigone was hillocked in the most marked fashion. The mucous membrane around the orifice was ridged like the wrinkles at the side of a spasmodically closed eye or compressed mouth. Upon the floor were several ranula-like bodies, evidently mucous glands exactly similar in appearance to those occurring on the lips and cheek. I re-examined a fortnight later; other glands seemed to have swollen, and those previously seen had apparently disappeared.

(c) *Phosphatic and Encrusted Growths* are sometimes exactly like stones,* but a touch with the tip of the instrument usually settles the matter.

The following case will serve to illustrate how closely some tumours resemble calculi both in the symptoms they elicit and the appearances they present under the light.

CASE 8.—R—, æt. 40, kindly referred to me by Dr. Fly Smith. Prior to two years ago the patient was in perfect health. On passing water one morning before breakfast at this date he noticed that the urine contained bright red blood. The blood was not in clots, it was intimately mixed. He could not account for the hæmorrhage. He saw no more blood, but began to experience pain after passing water—not during the act. It started at the neck of the bladder and travelled to the tip of the penis, leaving almost as soon as it had reached the glans. The frequency of micturition in the day was very variable: sometimes he would have to urinate four or five times an hour, sometimes he could retain his water for half an hour, very rarely for an hour, and

* It must be remembered that mucus-clothed stones resemble growths.

never longer than the latter. At night he would rise three times. He applied at a London hospital and was admitted. He stated he was sounded every day on which the surgeon visited his ward, "so certain was the surgeon in charge of his case that he was suffering from stone." He remained there six weeks. He got better, and for eight months was perfectly free from his complaint. At the expiration of this time all the symptoms of frequency recurred, and he applied to St. George's Hospital, where he was admitted and remained ten weeks. He was sounded and ultimately got quite well. This was in November, 1887. In July, 1888, after a period of seven or eight months of perfect freedom from all the symptoms, he noticed on going to bed some bright red blood in his urine. He came to me July 16th. On introduction of the cystoscope and without rotating it there was seen upon the posterior wall a roundish whitish-grey mass the size of a walnut. It appeared to be situated on a shelf of dark red mucous membrane. I could not quite make out if it was projecting from the mouth of a diverticulum, nor did I know whether I was dealing with a phosphatic encrusted growth partially hidden by transverse folds or an encysted calculus. I therefore introduced a sound and directed its beak towards the spot, but elicited no click of calculous material. On August 27th, six weeks after, I made, in conjunction with Dr. Fly Smith, an examination under ether. The size of the body had increased, and it was now obviously a tumour. It still rested upon a shelf of purple mucous membrane. Its sides were covered with thin floating films of mucus. The position and character of the growth was verified by suprapubic cystotomy. The growth recurred, as will be seen on reference to the sequel of the case, p. 176.

(d) *Submucous Hamorrhages*.—These are usually observed in hæmorrhagic cystitis, in some forms of tuberculosis, and in the rare cases of purpura (No. 3601, Hunterian),* and syphilis. They form elongated, oval, or roundish elevations of a deep

* Cf. author, 'Path. Trans.,' vol. xxxviii, 1887, p. 189.

red gelatinous aspect, very similar to epitheliomata. The neighbourhood of the former is, however, usually printed with hæmorrhagic spots, streaks, and blotches. The remaining surface, is, moreover, blurred and filamentous.

(e) *Tuberculosis*.—Of all the pathological changes of the mucous membrane which need most study, and in which the eye must be carefully trained, the most important are those due to tuberculous or scrofulous disease. Unfortunately, these are the very cases which resent instrumental interference of any sort, so that if the diagnosis is clearly made out to be tuberculosis by such objective and subjective symptoms as deposit of crude tubercle in the testis or prostate, with co-existing extreme irritability of bladder, pain in micturition, and puriform bacillary blood-stained urine, it is wiser to forego the examination with the cystoscope than to run the risk of exciting inflammatory change in a possibly damaged kidney (compare p. 207, *Dangers of Cystoscopy*).

Partly, therefore, because few suitable opportunities for the study of vesical tuberculosis will present themselves, and partly because this somewhat rare disease offers, in every grade of its severity and in every stage of its progression

towards resolution or suppuration, appearances which counterfeit those recognisable as characteristic of many of the complaints for which a cystoscopic examination would be undertaken, it will most likely be in this disease that the greatest number of mistakes in diagnosis will be made.

(1) Heaped-up, cockscomb-like projections of swollen mucous membrane not only mimic the stunted papillary fibroma, but also co-exist in rare instances with these warty growths. The extreme difficulty which the inexperienced eye may encounter will be well illustrated by the two following cases, the first of which is extracted from my post-mortem book and the second from my case-book.

CASE 9.—J. L—, æt. 27, had had evident signs of tuberculosis of the urinary tract for four years, testes and vasa deferentia being uninvolved. Nephrotomy was performed for a large right-sided pyonephritic sac, and the man gradually sank.

Right kidney: Disorganised renal substance replaced by large tubercular abscess cavities communicating one with the other. The right ureter was coated with the usual curdy deposit, and almost occluded in its upper third by a mass of similar deposit. Left kidney and ureter healthy.

Bladder: On opening the bladder it was seen that the entire mucous membrane had been cleanly dissected off by inflammation and ulceration from the subjacent muscle planes, except at the trigone. The trigone presented a most unusual and striking appearance. *The mucous membrane covering it had been loosened from its attachment at the sides of the trigone, and thus presented a fimbriated edge, which terminated at the mouth of the bladder in two*

auricular-shaped appendages of scarlet colour, evidently the injected and crumpled remains of the circumjacent mucous membrane. There was a small papilloma on the interureteral bar. It was noticeable that the right ureteral opening had been displaced outwards from its natural position, most likely by the circum-ureteral infiltration on that side. There was a yellowish mass of crude tubercle under the mucous membrane of the prostatic urethra, and the right lateral lobe showed two horse-bean-sized deposits of the same material. The vesiculæ seminales, vasa deferentia, and testes were entirely free from disease.

CASE 10.—R. D—, æt. 26, had been under the care of, and was kindly referred to me by, Dr. Shalders Miller, of Windsor. Seven years ago the patient began to suffer from pains on the left side of the back, coming on gradually. He also experienced a difficulty in making water, so that he was led to believe an obstruction existed at the neck of the bladder.

Shortly after the onset of the symptoms, on rising one morning he found himself quite unable to pass water. After much straining he voided a quantity of blood-clot and urine. The bleeding continued. Sometimes it was arterial in character. Sometimes it appeared in the middle of a clear urine stream, and sometimes at the end. Often it was intimately mixed and of a darker colour; usually in the morning it was a dirty brown. After a month's medicine the urine became quite clear and remained so, but the pain in the tip of the penis did not abate. This was more especially noticeable when he was working at his trade (blacksmith). He volunteered the information that striking at the anvil and filing at the vice "shook something in the bladder and he felt it in the penis." He had this pain, which varied as time went on in its position, for five years. Sometimes he was quite free from blood. He has had several attacks of retention from clots. Two years ago he married, though bleeding profusely at the time. Although the hæmorrhage then ceased for a short time, it recurred in a month, and has continued.

The frequency of micturition is every ten minutes, unless prevented by morphia suppositories. Before being sent to me he had been the inmate of two hospitals. At one he was considered

to be a malingerer, at the other (St. Thomas's Hospital) ulceration of the bladder had been diagnosed by Sir William Mac Cormac. Dr. Miller had diagnosed a growth at the left side of the base, obtaining evidence of its presence by introducing a large steel sound into the bladder and his finger into the rectum.

He was admitted into the hospital under my care in order to have cystotomy performed. No testicular or prostatic deposits were found. The urine contained blood and muco-pus. On passing a No. 30 (French gauge) electric cystoscope I found "chronic swelling of the mucous membrane; the left ureter was somewhat like a retracted nipple, being buried in a congested heap of purple velvety mucous membrane. Upon the interureteral bar was a papilloma of the broad-leaf variety, and a little lower upon the trigone another warty condition, which was made up of several parallel rows of deeply injected growth.* Further to the left of the left ureteral orifice, and more posteriorly placed, was a large crateriform ulcer, the edges of which were jagged, everted, swollen, and gelatinous-looking. Its aspect altogether was very similar to the scar on the target of a bullet impaction. I had but little doubt of the serofulous nature of the ulceration.

I performed the boutonnière operation in order to scrape away the growth and to drain the bladder and allow the ulceration to heal. He was much improved by the operation, but a troublesome fistula resulted, which Dr. Miller succeeded in closing with the galvano-cautery wire.

In the last report from the patient, under date December 26th, 1888, "I feel much better than I have been for years."

(2) The short and tag-like streamers of necrotic tissue resemble the necrotic villi or shreddy ulceration of neoplastic surfaces. As a good illustration of this I can quote the appearances of a bladder of a patient under Dr. F. M. Corner.

* Very similar in appearance to a specimen in St. George's Hospital Museum, 41c.

CASE 11.—Mr. W—, æt. 47, a hunchback. For two years the patient has had trouble with his urine. He first noticed a burning pain all along the canal, and a difficulty in making water, which was at first slight, but which gradually increased. After a little while these symptoms ceased, only, however, to recur. He would often be free for two or three months at a time. At Christmas, 1888, blood first appeared in the urine and pain in the glans penis; the blood was at times very profuse. The frequency of micturition increased until he was forced to pass water every hour, the call being very imperious and uncontrollable. Rest relieves all the symptoms. He does not suffer from any frequency at night. His testes and prostate are quite free. The urine drawn off previous to examination was like weak coffee water.

Cystoscopy.—Owing probably to the angular curvature of the spine there was some pressure upon the posterior wall of the bladder, for no light was visible on introducing four ounces of water; with eight ounces, which the bladder tolerated easily, the base and the ureteral orifices were plainly visible. Whilst searching the trigone a very curious phenomenon was observed. The eroded taggy edge of a deep ulceration was caught sight of; one of the swollen tags or edge lappets appeared to be adherent by only a very slender shred of tissue. Its oval purple body and whitish tufted summit could be seen floating vertically in the vesical water. Suddenly a rush of urine from the ureter caught and tossed this little index forward, the swirl forcing it flat against the bladder floor for a second or two, but it rose again, to be again swept over at the next ureteral contraction. I could have kept accurate time of the efflux from the left ureter had it been desirable, for the disturbing current alluded to issued from that side.

The diagnosis lay between tubercular and epitheliomatous ulceration. The small size, the depth, and the undermined, non-rolled edge of the ulcer, taken in conjunction with a consideration of the family history, the dorsal curvature, and the symptoms, were in favour of the former diagnosis, and the subsequent progress of the case has confirmed that belief.

(f) *Enlarged "Middle" Lobe of the Prostate.*—

It might seem superfluous even to mention that the

middle lobe sometimes forms a projecting, often more or less sessile mass, resembling a malignant growth from the prostate breaking through the trigonal tissues. Indeed I can conceive no greater difficulty in cystoscopy than to decide as to the benign or malignant character of a growth in this position.*

* In dealing with trigonal growths operatively, as some appear to do, it would seem at least of surgical and primary importance to ascertain the origin of such tumours, and yet, judging from published accounts, this seems to have been of no moment! It is sufficiently difficult even on post mortem to say definitely whether a malignant growth on the trigone takes its origin from the prostate or the trigonal tissue itself. In fact, some pathologists deny the latter position as capable of being a starting-point at all (Klebs, 'Handbuch der pathologischen Anatomie,' Berlin, 1870, Lief. iii). Although this is perhaps too sweeping, as the following case which came under my observation will show, yet the greatest reserve should be exercised in dealing with trigonal growths.

CASE 12.—J. K—, æt. 51, cornchandler. The history of the case is briefly as follows: Eight months before death the patient began to experience a constant desire to pass water, having to strain to complete the act. He suffered pain at the end of the penis after micturition. He also had pain in the hypogastrium and thighs, which was increased by locomotion. Intermittent hæmaturia was noticed. He had been a free drinker. *Status præsens*:—"He is a well-built man, with a good deal of subcutaneous fat; the glands in the groin are hard and shotty, as if syphilitic, those on the right side being especially enlarged. He is sent for the relief of a supposed calculus, but examination of the rectum shows that a hardness and unevenness exist at the base of the bladder and vesiculæ seminales, which is very suggestive of carcinoma. This condition is especially marked on the right side. The prostate

In such a case it is worth while to remember that prostatic carcinoma breaks through the trigone about its middle or more towards its base (interureteral bar),* whilst the intravesical out-

itself is not enlarged or hard." He was sounded, but with difficulty, the instrument having to be much depressed. He gradually sank. Autopsy: There was much visceral fat. The peritoneum was adherent to the back of the bladder in patches. On putting the hand into the pelvis the course of the vessels could be felt marked out by large brazil-nut-sized glands.

The margin of the true pelvis was thus very uneven, and its opening contracted. (The pelvic viscera were removed *en masse*). Carcinomatous deposits were to be felt along the back of the bladder. These were evidently deposits in those glands which follow the course of the vasa deferentia; they were, moreover, traced in direct communication with the iliac chains, and the enlarged glands in the groin. The bladder was opened in the middle line, and the muscle wall was seen to be slightly but distinctly hypertrophied.

Blocking up and distending the prostatic urethra was a firm mass of cancer which had its origin in the right side of the trigone, but which extended upwards to implicate the right ureteral orifice. The size of the growth was equal to a small Tangerine orange. Its surface was lobulated and uneven, it cut very firm. It was not ulcerated except at one spot where a small cavity was found plugged with recent blood-clot. Sections made through the prostate show it to be implicated in patches, but the disease had evidently commenced in the trigone and not in the prostate. The vesiculæ seminales were hard; their cavities were contracted, and their walls infiltrated with carcinoma. No deposits were found elsewhere. ('Path. Trans., vol. xxxix, 1888, p. 181.)

* I extract from my clinical and pathological note-book of prostatic carcinoma the following details of cases which have been under my observation the last five years. These will illustrate the difficulty in diagnosis.

No.	Name.	Age.	Variety.	Chief symptoms.	Post-mortem or examination.	Quoted.
1	S.	56	Hard	Difficulty	Trigone studded with erupting nodules	'Path. Trans.,' vol. xxxix, 1888, p. 195.
2	J. M.	26	"	Incontinence from spinal deposit	Trigone uninvolved; metastatic case	Ibid., vol. xxxviii, 1888, p. 196.
3	W. W.	59	"	Occasional hæmaturia	Left lobe, involving left half of trigone and left ureteral orifice	Ibid., vol. xxxvii, 1888, p. 199.
4	G. L.	53	Soft	Few symptoms	Trigone free; cocoa-nut-sized prostatic, right lobe breaking into rectum	Ibid., vol. xxxviii, 1887, p. 195.
5	S.	51	Hard	Difficulty	—	'Medical Society Trans.,' vol. x, p. 37.
6	T.	63	Soft	Few symptoms	Orange-sized growth into rectum; trigone unaffected	'Brit. Med. Journ.,' Oct. 22nd, 1887, p. 873.
7	P.	61	Hard	Symptoms of stone	Trigone invaded	Unpublished.
8	E. H.	63	Soft	Hæmorrhage and incontinence	Rectum filled with a small melon-sized mass from the prostate; trigone uninvaded (f)	"
9	M.	60	Hard	Hæmaturia two months	Entire trigone, hillocky, with scirrhous	"
10	J. B.	60	"	Difficulty	Trigone studded with erupting nodules, as in Case 1	"
11	O.	61	"	Frequency of bleeding	Left lobe	"

growth of a fibro-myomatous prostate is encountered at the very entrance to the bladder. The cystoscopist would act wisely if he allowed himself to be biassed more by the history and symptoms of the case than by the aspect of the tumour as revealed by electric light. In some of the denser forms of prostatic carcinoma, the symptoms of which generally simulate vesical growth, it will be found that it is impossible to introduce the electric cystoscope into the bladder, even under ether, without undue violence. Such a case was brought to me by Dr. White, of Stoke Newington, and I have met with another of a similar character in the care of Dr. Eccles, of Upper Norwood.

CASE 13.—Mr. O—, a thin spare man, æt. about 60, but physiologically young, who stated that he never had had a day's illness until twelve months ago, was brought to me by Dr. White for electric cystoscopy on September 4th, 1888. He complained of a bearing down and straining at the anus on micturition, accompanied by an aching all along the urethra at the same time. He passes water upon an imperious call day and night every two hours. His history was as follows:

Twelve months ago the patient noticed he passed brown urine. He paid but little attention to it, "thinking it was some excretion passing off." For three weeks the blood continued getting gradually less and less in amount, but as it diminished a frequency of passing water began to be experienced. He was taken to a surgeon, who diagnosed renal hæmaturia after sounding him. An ounce or two of residual urine was removed, his prostate was examined and declared to be rather thickened and slightly enlarged. After this examination he suffered from profuse hæmor-

rhage, which confirmed Dr. White in his belief that the trouble was of vesical origin. He gradually recovered, and eventually picked up sufficiently to return to a very onerous and important position in the City.

On examining him I found the stream of urine quite vertical. Residual urine amounted to six and a half ounces. Its sp. gr. was 1010. It contained pus, and proved to be rapidly decomposable.

On examining the prostate a hard nodule was felt in the left lobe, which was larger than the right, and an ill-defined thickening was detected at the bladder base in the position of the left vesicula seminalis. The right lobe was small in size for the age of sixty-one, and felt healthy.

On attempting to pass the electric cystoscope I encountered what I had expected—a warped prostatic canal, and though I used no force in my attempt to introduce it, I caused so much pain that I at once desisted.

The endoscope proving useless, the objective and subjective symptoms and history were carefully considered, and the diagnosis of carcinoma of the left lobe spreading to the left vesicula seminalis given to the friends. Cystotomy for the relief of the frequency, when that became more urgent, was advised. The patient bled after the instrumentation. Five months after, suprapubic cystotomy became necessary, and the patient died exhausted, though relieved, on April 1st.

CHAPTER VII.

VALUE OF THE ELECTRIC CYSTOSCOPE.

THE value of the electric cystoscope may be estimated in various ways. The instrument can either afford us a clearer insight into pathological conditions of the vesical mucous membrane, and enable us to watch the progress of the disease and the behaviour of the same under varying forms of treatment; or it may allow us to control our clinical observations and speculations by direct visual research, and rightly to assign the more prominent symptoms to definite causes; or finally, it may at once elucidate for us the cause of obscure symptoms of urinary disease, of which we otherwise could obtain no certain clue without a cutting operation.

Pathological Conditions of the Living Bladder as seen by Electric Illumination.

Cystitis.—The progress of inflammation of the bladder through the various stages of acute, sub-

acute, and chronic disease, can be watched not only with ease but also with profit by means of the electric light. Such a study is very necessary to develop a skilled cystoscopist, for the mucous membrane, as I have before mentioned,* varies greatly in its aspect, and the appearance and disposition of the swollen folds in the semi-dilated bladder are often fallacious.

Acute Cystitis.—This has been well investigated by Finger,† who restricted his examination to gonorrhœal cystitis. The appearances, according to that observer, are as follows. The mucous membrane, in proportion to the extent and intensity of the process, is more or less affected. It is especially changed at the neck of the bladder, being there swollen into irregular hillocky projections. This turgescence is either marked with dendritically anastomosing, greatly dilated vessels, or, in very acute cases, it is printed with hæmorrhagic spots, and streaks or blotches; or it appears of a uniform dark red colour. The epithelium is either collected in clumps or in long thready streamers, which float in the contents of the viscus. Acute cystitis of other origin, or an acute

* Cf. Chap. VI, p. 93, *Fallacies in Cystoscopy*.

† Finger, 'Wiener. med. Presse,' 1880, S. 997.

attack grafted on a chronic form, have very nearly the same appearances, only the extent is more marked. These cases often present but little or no blood in the urine.

CASE 14. *Chronic cystitis; confinement; hæmorrhagic condition of mucous membrane. Recovery.*—Mrs. C—, under the care of Mr. Samuel Benton. The patient had suffered from frequency and pain in passing water for one year. She can hold her water sometimes for five hours, at other times a great frequency is noticed, and then she often cries out with the pain she experiences in passing water. This pain is at the meatus.

Eight days before I was asked to see her she had been confined of a healthy child, the delivery being straightforward. She was suffering a great deal of pain on micturition. On examining the bladder I found the entire posterior wall covered with large and irregular blotches of bright red hæmorrhage (? from pressure in the delivery). The trigone was rucked up and of a dark dull purple colour and velvety aspect. So much was this the case towards the left side that it resembled a papilloma. No stone; no pain on examination; held six ounces of water with ease. Steadily improved under treatment.

By keeping cases under observation it will be found that these deep red blotchy extravasations diminish little by little as the intensity of the inflammation subsides, some of these patches taking, however, a very long while to disappear.

CASE 15. *Profuse hæmaturia; submucous extravasation; absorption of same.*—E—, æt. 34. Patient had suffered from recurrent and profuse hæmaturia for some months; generally pain before micturition. Had been sounded by several hospital surgeons. The hæmaturia subsided until it was reduced to the occasional

passage of very small tadpole-like clots. The cystoscope revealed the remains of a hæmorrhagic cystitis. Upon the trigone and in its left half was an elongated, oval, blood-red patch of upraised, injected, and swollen mucous membrane; it was well circumscribed. The surrounding surface was apparently healthy. I re-examined the bladder four weeks afterwards; the symptoms had greatly subsided, the hæmorrhagic swelling had disappeared.

Hæmorrhagic Cystitis.—The case just quoted leads to a consideration of an important and but ill-recognised form of cystitis, which may for convenience sake be placed midway between the acute and the chronic grades. I allude to hæmorrhagic cystitis. It is a subacute inflammation of the mucous membrane characterised by symptoms often precisely similar to those evoked by growth in the bladder, and is often most obstinate to cure. Although most often of a benign character, yet I believe that a certain form of hæmorrhagic cystitis precedes the formation of that stunted nodular carcinoma of the mucous membrane which accompanies interstitial malignant growth of the vesical wall. (Compare the pre-cancerous stage of the mucous membrane, p. 153.) Its characteristics and cystoscopic appearances can be exemplified by the following cases :

CASE 16. *Vesical irritability; hæmaturia; prostate uninvolved. Rapid recovery.*—Capt. C. T—, æt. 44, came complaining that for a month past he has been troubled with frequency of micturition,

which latterly has increased so greatly and the desire has become so imperious that he has been passing water in small quantities every ten minutes night and day. Three days previous to his consulting me he passed bright red blood at the end of the act, and continued to do so every time he made water. Capt. T— made water before me; the urine was quite clear until the end of the stream, when a rush of florid blood appeared. The prostate was not enlarged, nor was there anything abnormal in it to the sense of touch, On proceeding to inject the bladder preparatory to introducing the cystoscope, I found to my surprise that the sphincter could not retain any water, and that it ran out of the bladder as fast as I pumped it in. I therefore placed him under ether, and even then the same difficulty was observed. By grasping the penis I was at last able to keep four ounces of water in the bladder and urethra. No growth could be seen; the entire surface was velvety and marked by acute hæmorrhagic cystitis; the ureteral orifices were greatly swollen. Some unusual condition of the mucous membrane in the neighbourhood of the right ureter was present, but what its nature was I could not say. He rapidly improved under anodynes, and in two days could hold his water for three hours. The blood entirely disappeared, and he joined his ship in three weeks, to all appearance in perfect bladder health.

CASE 17. *Calculus; chronic cystitis; hæmaturia.*—Mr. F—, barrister, æt. 59, consulted me for hæmaturia. His history is as follows:

In March, 1885, lithotomy was performed for a small angular phosphatic calculus. The amount of blood which then appeared in the urine depended upon the amount of exercise taken. Since this operation he has suffered more or less from catarrh of the bladder, which increased greatly in December, 1888. The patient has always had very irritable mucous membranes, his throat and stomach frequently becoming inflamed upon any sudden increase of mental work or worry. In January, 1889, he commenced to pass blood, and has continued to do so without intermission for five months. The urine is of a dark brown colour, the blood being uniformly mixed, the amount of blood being worst at nights.

He suffers no pain, and only occasional irritability. On examination I found that the prostate was not enlarged, that no residual urine was present, that the stream was full and forcible, never intermitting. On cystoscopy no tumour or growth was visible; the mucous membrane was swollen and gelatinous in every part, and of a dark, dull, purple colour. Evidently the blood was oozing from many points. The injection of warm water irritated the bladder greatly, and he passed an increased quantity of blood for a few hours after the examination. This excess, however, rapidly subsided.

Chronic Cystitis.—The cystoscopic appearances of chronic cystitis depend largely upon the degree of the attendant inflammation. If that be slight, then the mucous membrane is strikingly white and gelatinous-looking; its thickness, as measured by the rugæ, is increased. The anastomosing vessels are absent, whilst here and there clumps or streamers of muco-pus are observed attached to the surface. Should, however, a higher grade of inflammatory congestion be present, then the entire surface, but more particularly the base, is swollen, blurred, and of a dull dark red. The muco-pus may be present, but usually in the form of scraps and thin curled-up flakes which adhere to and peel off from the walls. The symptoms of the cases usually correspond to these appearances, the former class exhibiting less irritability and pain than the latter.

Again, the former appearances are more often met with in the less severe forms of urinary obstructive disease, such as slight hypertrophy of the prostate or stricture, in which the irritation of the residual urine,* the endo-vesical pressure, and the loss of nerve-force is but little. The following cases will exemplify the varieties.

CASE 18. *Enlarged prostate; atony of bladder; chronic cystitis. Amelioration.*—Mr. D—, æt. 57, under the care of Dr. Stewart, of Newport-on-Tay, and Dr. White, of Stoke Newington, has had symptoms of enlarged prostate for a year. He complains chiefly of frequency of micturition, the call recurring every two hours, although he uses a catheter twice a day. Residual urine amounts to six ounces.

Cystoscopy.—"Mucous membrane somewhat white and more bloodless than normal. Hanging dependent from the surface of the bladder walls are larger and smaller clumps of muco-pus. These every now and again loose their hold, and, falling, drop on to the prism and obscure the view until dislodged; or float gently downwards, and pass the lamp and prism like large, irregular snow-flakes. The surface has lost its glistening reflex; it is blurred." The middle lobe of the prostate is especially prominent, but the entire urethral orifice is surrounded by a collarette of the hypertrophied gland.

Patient improved greatly under treatment.

CASE 19. *Stricture of urethra; fistula. Great irritability of bladder.*—Captain G—, æt. 49, with a family history of phthisis, has suffered from stricture for twenty-five years. Has been wearied out during the last four years with a frequent desire to

* (Author). "Prognosis in Organic Stricture of the Urethra," 'Medical Chronicle,' Oct., 1888.

pass water, the call being repeated every half-hour to an hour. He can go nowhere, transact no business, enter no society, on account of this irritability. Much pain is experienced in the bladder and along the urethra both before and after micturition. He volunteers the statement that he feels something (which he believes to be a stone) rolling about in his bladder as he moves. The stream has not much force. Residual urine amounts to two and a quarter ounces. A urinary fistula exists in the perinæum; the stricture, which is situated at the bulbo-membranous junction, admits a No. 10 (English) bougie. On passing the electric cystoscope the entire bladder-surface was seen to be of a dull red, flecked with adherent scraps of muco-pus and debris, very much like a diphtheritic sore-throat. No stone, no growth. Patient left town holding water three to four hours.

CASE 20. *Chronic cystitis, with irritability of bladder.*—Mrs. S—, æt. 54, under the care of Dr. Buchanan, of Chatham. Twenty-one years ago, after a confinement, she noticed that she could not retain her water long, and that if the desire to pass the urine was not immediately complied with the water used to run away. Up to seven years ago she was free from absolute pain, but since then she has suffered supra-pubic pains, which have extended down the front of the thigh even to the toes and the soles of the feet. She obtained relief by passing water. If the patient remains sitting she can hold her urine for two hours, if walking, she must evacuate every half-hour. The urine is muco-purulent. On cystoscopy, it was found that the bladder could only retain two ounces. The mucous membrane was of a dark purple colour, relieved here and there by innumerable white patches of scaling-off muco-pus; in fact, it was somewhat similar to an old white-washed ceiling, with the plaster curling up and flaking off in patches. Patient improved.

CASE 21. *Chronic cystitis, with irritability.*—R. S—, æt. 27 (hospital patient under the care of Mr. Bowreman Jessett). Noticed three years ago that her urine had become thick and cloudy. There is pain before and after micturition. There is

undue frequency. The urine is also thick, and contains much muco-pus. A cyst was removed from the urethra by Mr. Jessett, but the symptoms continued unabated.

The urine was evacuated, and the bladder washed out, but the medium introduced became immediately cloudy. "The mucous membrane was greatly swollen and heaped up in every part of the base. That covering the lateral and posterior walls was less injected, and appeared less thick.

"The trigonal surface could be slightly rucked up by the beak of the cystoscope, and an appearance produced very like a projecting growth.

"The ureteral orifices were deeply sunken in the surrounding spongy mucous membrane. A uniform dark red was noticed at the base, the colour becoming more of a normal reddish straw towards the sides and vertex."

Scrofulous and Tuberculous Disease of the Mucous Membrane.

I must confess at once to be unable to diagnose by sight between these two forms. That two forms do exist in the bladder I have but little doubt, for clinically I have had cases of intractable vesical ulceration in typical scrofulous patients under my care for two or more years without any apparent progression or any apparent healing; without other and neighbouring organs, such as the prostate, kidney, or testicle, becoming infected; in which the urine did not contain bacilli; and in which no form of treatment, general or local, had any curative effect. On the other hand, patients

have come under my notice and care with typical vesical ulceration, who have passed rapidly through the various stages of infection, local and general, and in whom the post-mortem has revealed ample microscopic and macroscopic evidence of tuberculosis of the entire urinary tract. It is wise, therefore, in giving, upon visual grounds, a prognosis of vesical ulceration in patients of strumous diathesis, to carefully weigh the accompanying objective and subjective symptoms, and to be guided rather by them and by the extent and position than by the aspect of the ulceration.

Tuberculous ulceration, practically speaking, occurs in two regions: either on or near the trigone (at the base) or upon the posterior wall.* If situated on the trigone it is almost always secondary to a deposit in the prostate. If placed in the body of the bladder it is usually primary. It is obvious that the practical difference lies in prognosis and treatment, the former position being unfavorable and the latter often hopeful. Moreover, the aspect of the ulceration in these two regions is somewhat different. That on the floor

* The rarest of all positions is the anterior wall. A case has been brought forward by Dr. Philip, of Edinburgh ('Brit. Med. Journal,' Feb. 2nd, 1889, p. 248), in which no symptoms were observed.

is usually more extensive but shallower, the ulcers having sharply defined, roundish edges, whilst that on the posterior wall, commonly exciting more inflammatory œdema, appears deeper and more severe.

CASE 22. *Old hip and spinal disease; symptoms of strumous disease of the bladder. Perineal cystotomy; no relief. Cystoscopy; ulceration on posterior wall.*—Mr. W—, æt. 20, first came under my care in July, 1885. He was then complaining of frequency of micturition, with pain suprapubically and in the glans penis before and after making water. The urine was pale and murky with pus. There had been no blood observed. The symptoms had been noticed for a year. The patient was a thin, strumous-looking lad, and had been treated by Mr. Robert Debenham at the age of 4 for hip disease. The joint ultimately recovered and the spine became affected. An angular lateral curvature in the lumbar region, and deep scars of a probable psoas abscess which broke over the left Poupart's ligament, are evidences of the severity of the disease. The lower ribs almost touched the iliac crest on the left side, and on lateral inclination of the body they passed within the iliac fossæ. There was no deposit to be felt in either testicle, kidney, or prostate. There was neither stone nor stricture. Nothing relieved the pain or the frequency, but both symptoms gradually increased in severity until at last I was forced to perform a boutonnière in September, 1885, in the hopes of giving relief. Nothing could be discovered to account for the symptoms, so I drained the bladder for a month; every day he was washed out with iodoform mucilage. The tube was removed, but immediately the incision had healed, the call for micturition was repeated night and day every two hours, and the pain returned nearly the same as before. I lost sight of my patient until January, 1889, when he came bringing with him a letter from Dr. Goldie suggesting electric cystoscopy. He was exactly in the same condition as in 1885. On examination I found to my sur-

prise that the posterior wall of the bladder was highly inflamed and covered over with irregular-shaped shallow ulcers, the edges of which were neither upraised nor thickened. The bases were powdered over with white granular deposit of lime phosphate. The base of the bladder was healthy. No deposit in testes or prostate. I was forced to conclude, therefore, that matters had remained nearly in the same condition for over three years.

CASE 23. *Formation and healing of a tuberculous ulcer on the posterior wall.*—A young man of about 20 was sent by Dr. Carvell to Mr. Reeves, of the London Hospital, on September 18th, 1888. He complained of having recently passed blood. Without putting the patient under an anæsthetic I washed the bladder out, and replaced the murky urine with clear water. The patient felt a good deal of pain on the introduction both of the catheter and cystoscope. Situated upon the posterior wall behind the left ureteral orifice was a small ulcer. Its edge was pink, its centre yellowish (sloughy), and the surrounding area was purplish with congestion. He was placed upon santal-oil. On September 20th, two days after, the patient expressed himself as being much relieved, the bleeding had ceased, the urine was quite clear. I searched in vain for the small ulcer I had previously seen. Situated on the left side of the bladder, however, on the posterior wall, was a yellowish nodule like a deposit of crude tubercle the size of a pea projecting beneath the mucous membrane. The surrounding area was deeply congested, and small capillaries radiated from the nodule like an injected Peyer's patch (microscopical) of the small intestine. The remaining mucous membrane of the bladder was deeply injected but not swollen; it was covered with extremely fine crinkles like the markings of watered silk. I had no doubt that I had to deal with the very commencement of ulceration of the bladder of a tuberculous type.

Typical cases.

CASE 24. *Hæmaturia, frequency, and pain; tuberculous ulceration of posterior wall.*—Miss H— was brought by Dr. Street, of

Westgate-on-Sea, on March 13th, 1889, for cystoscopy on account of obscure vesical symptoms. The patient was a well-grown girl, æt. 16. Up to September, 1887, although somewhat ailing in health, she had been fairly well. She then found herself obliged to rise two or three times at night; gradually suprapubic pain was experienced and blood appeared in the urine. She was sounded in February, 1888, with a negative result. The mother died of phthisis and the patient suffers much from chilblains.

The examination was conducted under an anæsthetic. The urine withdrawn, was of a typical renal colour. The washing out of the bladder was done most gently, and when the return wash was perfectly clear six ounces of boracic solution were injected. When four ounces had been introduced the patient became restless and the vesical resistance appreciably increased. The cause both for the jactitation and the resistance was understood when the electric cystoscope was passed, for the mucous membrane was seen to be tightly stretched and deeply injected in every part, the vessels being large, prominent, and numerous, and in patches, resembling the straight vessels of an acute iritis. Several trunks had been over-stretched, and from the damaged parts there issued many tricklets of blood which ran in parallel lines down the sloping posterior wall, like rain down a window pane: a useful lesson of the effects of even slightly over-distending an inflamed and contracted mucous membrane.

At the left ureteral orifice and slightly behind it was seen a patch of blood-red extravasation, whilst towards the right base was observed an everted-edged ulcer with an irregular base, the mucous membrane in the immediate neighbourhood being greatly thickened and gelatinous looking.

CASE 25. *Urethral irritation; recurrent hæmaturia; scrofulous ulcer of posterior wall.*—Mr. R—, æt. 20, consulted me in October, 1888, on account of hæmaturia.

Patient was very hirsute and strumous looking, but a well-built and well-nourished man. He never had had any venereal affection. He was perfectly healthy up to January, 1888. At this date he began to experience "a nasty itching pain" all along the urethra,

starting from the anus and finishing at the glans. The pain became constant. It was increased by making water, which he passed five or six times daily; the urine was thick and stained the chamber. This irritation gradually ceased under treatment. A month after leaving off medicine he passed clotted bright red blood. The urine first passed was clear, the stream then became obstructed by clots, which were expelled and were followed by clear urine again. The next time he micturated it was "pure blood." This attack gradually passed off and he was free for a fortnight. On Friday morning, June 7th, 1888, he was awoke by an excruciating pain in the left side (? renal) which induced another attack of irritation of the urethra, but it gradually subsided.

He continued well, except for a drop of blood at the end of making water, without frequency and without pain, until October 1st, 1888, when he again passed without any warning a quantity of blood.

On cystoscopy the mucous membrane of the entire base of the bladder was seen to be of a dark red, gelatinous aspect. On the posterior wall was an irregular gelatinous-edged ulcer, which evidently had increased lately and that rapidly, for tags of necrotic tissue streamed from the margin. Blood clots were adherent here and there, like little villi, to the surrounding mucous membrane.

CASE 26. *Hæmaturia of eight years' duration; ulceration of posterior wall.*—Mr. J. V—, æt. 46, married, with a phthisical family history. The patient had been troubled throughout life with an irritable bladder, having had to pass water once or twice and even thrice at night, and holding water in the daytime from one to three hours. Some of his children also have a similar difficulty.

Eight years ago he noticed on micturition that the urine was bloody. After a bottle or two of medicine the water resumed its natural colour. Since this time sometimes every two and sometimes every three months the urine becomes bloody. The attack usually lasts a week or a fortnight. He thinks that the amount of

blood is worse in the summer months. For the last two years the hæmaturial attacks have become more frequent, and now, any extra exertion will bring them on. The colour is usually thick port wine. Much clot and mucus (one-sixth) is also present. He has suffered no pain throughout, simply a slight burning sensation when the blood is passing. Latterly this sensation has been present even when the urine is clear.

Cystoscopy.—"The base of bladder, as well as entire surface, was seen to be blurred; the ureteral orifices are proptosed slightly. Posterior wall ulcerated superficially."

The ulceration, as I have said, instead of being confined to a small patch, and on the posterior wall, may occur in the base and be secondary to deposits in the prostate. Usually also the focus is large enough to cause the implication of a much wider area, and the prostate being affected there is consequent increase in the severity of the symptoms.

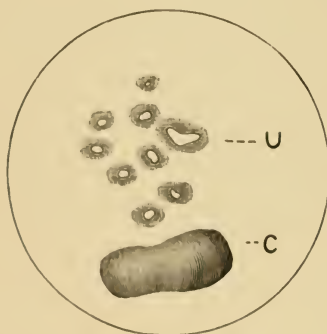
The following case which I examined with Mr. McCarthy, and for the notes of which I am indebted to the house surgeon, Mr. J. H. E. Jarvis, is a good illustration.

CASE 27. *Onset of vesical tuberculosis of prostatic origin*.—Wm. G—, æt. 26, admitted into the London Hospital, April 9th, 1888, with hæmaturia. The patient first noticed blood in his urine on April 8th, but for some days previously he had been compelled to pass water very frequently. He has also experienced a good deal of smarting pain in the perinaeum and penis. The urine is very bloody, clots and almost pure blood being expelled at the finish of the act. Sp. gr. 1026; acid.

After a few days of hæmorrhage the patient complained of sharp pain in the right side which became worse at nights. On rectal examination the right lobe of the prostate was found to be very hard, though the bulk was not increased. The left lobe contained a hard nodule the size of a small marble.

On passing the cystoscope and completely rotating it, the base of the bladder on the left side was seen to be covered with small punched-out ulcers (Fig. 27, U), the base of most of the ulcers had still adherent to them little yellowish sloughs,—clear evidence that the change was very recent; whilst more posteriorly (C, Fig. 27) an extravasation beneath the mucous membrane had caused

FIG. 27.



a body of a deep red gelatinous appearance to be formed, somewhat like a commencing epithelioma. Five days after the examination the following is noted: The urine is now free from blood and pus, and patient suffers no pain during or after micturition.

The ulceration may proceed so far as to strip away large patches of mucous membrane, and in some cases the entire surface of the bladder may

be bald except at the trigone.* Such a case was the following.

CASE 28. *Renal phthisis; tubercular exfoliating cystitis*.—Mr. W—, æt. 37; under the care of Dr. Grose, of Melksham, and kindly referred to me by Dr. Cole, of Bath. Family history of gravel.

Six years before consulting me the patient passed two tadpole-shaped clots of blood. Three months after, a profuse hæmaturia set in, accompanied by pains across the back. The blood was always mixed with the urine, sometimes it was black but never arterial; no smell. He suffered no pain in the bladder or urethra except when he was passing clots. Frequency of micturition was every hour and a half. He had, after this attack left him, no recurrence of the bleeding for seventeen months; then it returned as bad as ever. Since then the hæmaturia has been intermittent, but always profuse. He was examined by various London surgeons, and sent by one of them for diagnostic purposes out for a drive in a shaky omnibus. The jolting did not cause hæmorrhage, but he suffered so much pain in his back that he reached home with the greatest difficulty. He has been losing flesh lately. *Status præsens*: "Passes his water very frequently and very little at a time. The urine is bloody and extremely foul. The urethral canal is excessively tender; the bladder barely tolerates, without anæsthesia, three ounces, and with an anæsthetic six ounces.† When thus distended it feels like an india-rubber air-ball. Bladder wall thickened with pericystitis(?) Adhesion of gut to posterior surface; the prostate is very small. *Cystoscopy*: no growth or stone; the mucous membrane of the bladder is so thickened and ulcerated that with six ounces it shows no crease or crinkle. In parts it is either removed or in the process of being cast off." The after-history of the case is typical of the disease. The

* Compare case on p. 110.

† Compare dangers of over-distending a tubercular bladder, p. 131.

hæmaturia continued until presumably the mucous membrane had been completely stripped; then incontinence set in.

The practical value of the cystoscope in the *treatment* of these cases is referred to on page 215.

Foreign Bodies.

Fillenbaum's* case stands first in the literature, and affords a just comparison between the use of the cystoscope worked by electric light and that by other sources of illumination.

Discovery of a Nélaton Catheter in the Bladder.—Herr Franz R—, æt. 54, had suffered from tabetic atony of the bladder for some years, and was in the habit of relieving himself with a Nélaton catheter. He was awakened one night by a call for micturition. He passed the catheter in the dark and evacuated the bladder. Thereupon he must have fallen asleep without withdrawing the instrument, for on awaking he found, to his horror, that the instrument was nowhere to be seen; a

* Fillenbaum, 'Extraction eines Nélaton-Katheters aus der Harnblase,' 'Deutsche Zeitschrift für Chirurgie., Bd. xx, S. 453, 1884. Compare Schustler, 'Wiener med. Wochenschrift,' 1885, p. 238, No. 8. The piece of the Nélaton catheter found in the bladder in Dittel's case was 18 cm. long. It was thickly coated with phosphatic deposit.

diligent but fruitless search was made, and, as he suffered no inconvenience, his story was doubted by his attendants. He came under Professor Dittel's care. Neither the catheter, sound, nor lithotrite revealed the presence of a foreign body in the bladder. The urethra was roomy, and the bladder anæsthetic. Grunfeld's endoscope was therefore introduced. "The examination gave, however, a completely negative result. The cystoscopic 'picture' was badly illuminated and blurred. The mucous membrane appeared of a dark red colour; at one moment it seemed as if a dark shadow lay before the prism, but it could not be accurately defined, nor was an opinion arrived at as to whether a foreign body was present in the bladder or not." On the next day the Nitze-Leiter endoscope was used. "The appearances were unusually sharp and bold, the base of the bladder appeared bright red, like the retina of the eye. Suddenly there came into view a symmetrical, elongated, yellowish body, somewhat like an *Ascaris lumbricoides*, which was evidently the catheter covered with a yellow urinary deposit." The worm-like appearance of the instrument is well shown in two (rather highly) coloured pictures which illustrate the article. It was re-

moved by means of a small Leroy d'Etiolles lithotrite. Schustler records a similar case.

*Nicoladoni's Case.**—Demonstration of a needle sticking in the wall of the bladder. Alois K—, æt. 18, came under the care of Nicoladoni; nine days previously he had inserted a pin head-foremost into his urethra; it had slipped suddenly from between his fingers, and had disappeared; since which time pain, especially great towards the end of micturition, had been experienced. Sound-ing gave a negative result. The result of the endoscopy is thus described :

“ By sinking the ocular end of the Nitze-Leiter cystoscope one could distinguish the metallic glisten of the pin, which was sticking in the wall on the right half of the anterior surface, towards the apex of the bladder, measuring with the head about 2 cm. in length. It was somewhat bent, and threw a strikingly conspicuous shadow upon the bladder wall, the pale mucous membrane of which was marked by meshes of anastomosing vessels. I was able to demonstrate most satisfactorily this never-to-be-forgotten picture to a large class of students and colleagues.”

* Nicoladoni, 'Stecknadel in der Männlichen Harnblase,' 'Wiener med. Wochenschrift,' 1886, Nos. 7 and 8.

Supra-pubic cystotomy was performed, and the pin removed; it was 4 cm. long. It had been buried 2 cm. deep, and though it had been in the bladder fourteen days yet its surface was unencrusted. The wound healed by first intention.

Dr. Nitze's Case of Cystoscopic Discovery of a Silk Ligature Ulcerating through the Bladder Wall.—Frl. S—,* æt. 35, had ovariectomy performed upon her on the 10th of April, 1885, by Dr. Martin, the left ovary being removed. The pedicle was secured by numerous silk ligatures, and dropped back into the pelvis. The recovery was rapid, and in twenty-one days the patient left the hospital well. She remained in good health until the onset of her present trouble, which commenced in February, 1887 (*i. e.* twenty-two months after the operation), with frequency, straining, and burning at the end of micturition. By the middle of May the cystitis was very severe, and the patient had to keep her bed, suffering from high fever, frequent rigors, cystospasmus, great frequency, painful micturition and defæcation. At first the urine was only murky, but suddenly it became mixed with blood,

* History extracted from Dr. Nitze's article, *op. cit.*

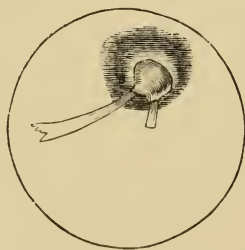
pus, and necrotic débris. This condition remained some weeks, and gradually cleared off, leaving the urine murky as before. On the 25th July a stone was discovered by means of the sound, and in the following week a portion was removed with the lithotrite. After this sitting the patient evacuated with her urine a silk thread $1\frac{1}{2}$ centimetres long.

On the 18th August the patient came under the care of Dr. Nitze. The sound demonstrated the presence of the stone left at the first operation. After cocainisation the stone was crushed, and a large part removed; subsequently a thick silk *ligature* was passed. On the next day another sitting was undertaken and all the stone removed. In attempting to remove the lithotrite, however, a resistance was encountered as if it was being held by some power in the bladder. Dr. Nitze realised that such restraint could not be due to a fold of the mucous membrane caught between the blades, for the instrument was freely movable in all directions, only when he attempted to withdraw it was the difficulty encountered. On the careful application of extra traction the instrument was removed, and between the jaws was found the cause of its detention,—a loop of

silk ligature, which had evidently been one of those employed in treating the ovarian pedicle. It had doubtless ulcerated its way through the vesical wall along with the other loops, inducing the acute cystitis which had supervened, and the deposition upon them, as foreign bodies, of calculous material. The one just withdrawn had evidently become entangled in the blades of the lithotrite, and had been dragged out of its bed in the mucous membrane.

On the 20th August neither sound nor lithotrite could detect anything further in the bladder. The cystoscope was thereupon introduced to ascertain if any more ligatures were embedded in

FIG. 28.



the wall, upon which more phosphatic material might be deposited and the disease perpetuated. Upon the left side of the bladder another ligature was discovered. One of the ends projected out

from the wall, glistening in the brilliant illumination of the light, a smaller and shorter end was found below, and the middle, or loop and knot part, was buried in a rose-coloured granulation-papilla, which sprang from a well-marked crater-like depression in the mucous membrane (Fig. 28). The longer thread threw a distinct shadow on to the subjacent surface, which travelled to and fro according to the movements of the lamp. The ligature had exactly the same appearance as the one removed the previous day in the blades of the lithotrite. The transit of this latter loop and its predecessors had left small but visible scars upon the wall.

Dr. Nitze now introduced a lithotrite, turned its beak towards the point indicated by the cystoscope, cleverly caught the end of the ligature in the grasp of the instrument, and jerked it free. A two-centimetre-long thread without the knot was found between the blades. The knot remained in the wall.*

* A case of a hair-pin seen, and removed from the bladder of a woman, aged 23, by Prof. Von Antal, of Budapest, after an attempt to photograph it, is recorded in 'International Centralblatt für die Physiologie und Pathologie der Harn und sexual Organe. Bd. i, Heft 1, p. 18, March, 1889.

Calculi.

Calculi often form very pretty objects under the electric light. They are readily diagnosed, and that without the manipulation which is often needed to demonstrate their presence with the sound. They usually appear as brownish or whitish marble-like bodies resting on the bladder base, and throwing a dark shadow upon the subjacent mucous membrane. Sometimes, however, the stone or stones are covered with thick layers of muco-pus, which is brown or black with deposited altered blood and enveloped in floating films of mucus. Dr. Nitze* thus describes a case which he demonstrated to Professor von Bergmann. "Directly the prism had penetrated the bladder one perceived a group of stones with facettèd surfaces, like piled-up chalk blocks. The rotation of the cystoscope slowly on its axis caused the picture to be changed like a kaleidoscopic view, in which a built-up system is suddenly overthrown, and the pieces fall together in apparent confusion, but only to become arranged in another and as definite a pattern. Two large lumps built together a gate-

* Nitze, op. cit.

way opening, through which the inflamed mucous membrane could be seen; but at the next there was a sudden downfall, and finally one stone dropped across the prism and seemingly plunged the bladder into darkness."

The following cases from my note-book will serve as illustrations.

CASE 29. *Single calculus. Four years' history.*—Mr. H. H—, æt. 31, sent by Mr. J. C. Molson, of Plaistow. Patient complained of difficulty and pain in making water. He gave the following history. Eight years ago, after an attack of smallpox, he noticed a difficulty in making water. The impediment, if such existed, was soon overcome, and the circumstance was forgotten. Some time after this he suffered from right renal colic on several occasions, and ever since the date of the last attack, four years ago, he has had increasing difficulty in miction. He has had no hæmaturia; the pain experienced was variable in amount and site, but it was always present in the back. Sometimes it was supra-pubic, sometimes penile and perineal. He complains, moreover, that he feels something move about in his inside, and this something he has to shift before the urine can be evacuated. His urine was murky, containing albumen and much phosphatic debris. Residual urine was found to the amount of eight ounces. On introduction of the cystoscope a large, irregular, brownish-white calculus with a flocculent envelope was seen lying on the right side of the base of the bladder. It was subsequently verified by the lithotrite, and gauged to be one and a half inches long.

CASE 30. *Single calculus behind a prostatic collarette.*—Mr. M. J. C—, æt. 66, sent by Mr. Hichens, of Redruth, with the diagnosis of calculus. I am indebted for the notes of the case to Mr. W. C. Hichens. The patient had never been sounded, for he would not allow of instrumentation except under an anæsthetic. He had

enjoyed very good health until the present illness. He is hale and hearty for his age.

Ten years ago the patient had, judging from the description he gives of his symptoms, an attack of renal colic. He noticed that he passed some sand with his urine at the time. He remained well and free from any further renal trouble until sixteen months ago, when he found blood in his urine, and evacuated some gravel as on the previous occasion. Eight months after this (*i. e.* eight months ago) he had another severe attack of renal colic, accompanied with the discharge of more gravel. But after this attack he experienced some straining on micturition and occasionally a stoppage of the flow of the urine during the act. He suffered but little pain, being quite free when at rest, and having only slight pain on taking gentle exercise. Any violent exertion, however, induced a good deal of suffering and a free evacuation of blood.

I was inclined to believe that a growth or intra-vesical prostatic outgrowth was the cause of the violent hæmorrhage which supervened on any unusual exertion, for the bleeding was quite out of proportion to the pain experienced. The patient, moreover, had no characteristic penile or perineal pain on micturition. I determined, therefore, to use the cystoscope before the sound. The patient was chloroformed and Leiter's pattern introduced. The sides of the bladder were healthy but trabeculated. On turning the instrument over so as to overlook the trigone I saw a glistening white stone lying partially concealed in a fresh blood-clot. No growth was discovered. The stone lay in a pouch behind the upraised collarette of the enlarged prostate. The sound was introduced, turned over, and the stone immediately struck, ringing sharply; the lithotrite gauged it to be one and a half inches long. I removed it suprapubically. It was an elongated oval stone, with a nodular surface; the projection of brown uratic nodules were surrounded by, and partly overlaid with, a white phosphatic encrustation.

CASE 31. *Large phosphatic stone inducing profuse hæmaturia.*—Mr. J. F. H—, æt. 60, under the care of Dr. Fitzroy Benham, had suffered from boyhood from difficulty in retaining urine. Had a

sharp attack of gravel twenty-one years ago, and since then has experienced difficulty in holding his water. A year before coming under my observation he caught a severe chill and passed a very large quantity of blood, great irritability of bladder being also present. His urine lately has become foul and is frequently mixed with much blood. There is imperious desire for frequent micturition and pain attending the act. Two medical men who had been in attendance believed him to be suffering from growth in the bladder.

Cystoscopy showed an extensively but superficially ulcerated bladder and a large brown phosphatic stone, which I subsequently removed by the lithotrite.

CASE 32. *Multiple calculi*.—J. R—, æt. 75 (hospital patient), a month before Christmas, 1883, suffered from a sudden attack of hæmaturia, a pint of black blood passing just before going to bed. He was admitted into the London Hospital, and the hæmaturia partially subsided and he attended among my out-patients. The symptoms continuing he was sounded and calculus discovered. Perineal lithotomy was performed and a large number of small calculi were removed from a pouch behind the prostate. In 1888 he again returned, was again sounded, and in the quarry whence the previous collection had been extracted was now seen with the electric cystoscope another accumulation of glistening, white, facettèd stones, which on being disturbed fell together in a manner described by Dr. Nitze (p. 143). Lithotrixy. This patient has again returned with two or more calculi.

Encysted Stone.

Schustler* reports a case under Professor Dittel, of a man, æt. 68, suffering from hypertrophy of the

* Schustler, "Beiträge zur kystoskopischen Diagnostik," 'Wiener med. Wochenschrift,' 1886, No. 13.

prostate and the presence of a large, soft, vesical calculus. On performing lateral lithotomy it was found that the great enlargement of the prostate prevented the finger-point from penetrating the bladder. On attempting to remove the stone with the forceps, the former broke into pieces and the fragments were removed piecemeal. Subsequently stones were found from time to time by means of the sound, and were removed through the perineal wound. Despite four months' thorough treatment, the bladder symptoms remained unabated, and the Nitze-Leiter cystoscope was therefore introduced. "This examination showed, to the surprise of all who had watched the case, the presence of a stone, which was confined in a diverticulum deep in the base of the bladder, and which projected but a slight way out of the mouth of the sac. The calculus was firmly fixed and resisted all efforts at removal." The difficulty of diagnosing encysted stone by sight is well illustrated by the following case :

CASE 33. *Profuse hæmaturia due to stone-capped epithelioma.*
—W. S—, æt. 35, came to St. Peter's Hospital complaining of hæmaturia and post-scrotal pain of three months' duration. Three and a half months ago he felt a sudden "stitch-like pain"

in his left side; and a quarter of an hour after, he passed water of a beef-tea colour. Nine days after this on returning from a long walk he passed pure blood at the end of making water. He had then no pain and no frequency. The bleeding disappeared. In seven days' time he had another and a precisely similar attack. He consulted various medical men and attended St. Bartholomew's. He was sounded with negative results by a very capable surgeon and did not bleed after the instrumentation. Gradually post-secrotal pain was felt on micturition and the blood became constant.

He now passes water every hour or every hour and a half, and gets up four times at night. Residual urine amounts to two ounces. As the symptoms were not characteristic of stone I examined him with the cystoscope first, and saw a brownish, irregular body enveloped in a haze of mucus, which no amount of washing out would remove. The body sprang from the left side of the base of the bladder by the left ureter. I was uncertain as to whether I was dealing with a phosphatic, blood-encrusted growth or an encysted calculus. On passing the sound a stone could be felt far back in the bladder on the left side. *Per rectum* a hardened lump could be felt in the corresponding area. The patient was admitted into St. Peter's Hospital under the care of my senior, Mr. Coulson, who introduced a lithotrite, but the body could not be grasped in any position of the instrument. The male blade scraped the surface, bringing away brownish muco-phosphatic material. The cystoscope was again used, and the track of the lithotrite jaw could be seen upon the surface of the projecting nose of the body. Next day the patient passed a quantity of calculous material like split percussion caps. He eventually died, and I found on post-mortem a broad-based epithelioma, the lobules of which were capped with thick concave crusts of lime phosphate.

If the encysted stone be a large one it may so press upon the base and back of the bladder as to approximate the posterior to the anterior surface, leaving no room for the cystoscope to work in.

That instrument will then be valueless, as occurred in a case I brought before the Clinical Society. If the encysted stone is even moderately large, however, the diagnosis is quite sufficiently established by rectal examination.

CASE 34. *Encysted stone, weighing six ounces, removed suprapubically after section by means of chisel and mallet.*—Mr. D—, æt 44. The patient had been under the care of Dr. Hine, of Leytonstone, who kindly sent him to me. The symptoms had lasted eight years. The calculus could be felt bimanually. Nothing could be seen with the electric cystoscope, for the capacity of the bladder was almost nil. The stone was subsequently discovered, upon the performance of suprapubic lithotomy, to be hour-glass in shape. The smaller piece (one ounce and a half) was found projecting into the bladder at the level of the left ureteral orifice, and the larger portion (four ounces and a half, the size and shape of a large hen's egg) lying in a diverticulum outside the back and base of the bladder. These two portions were connected by a very slender neck protruding from the threepenny-piece-sized orifice of the diverticulum. The position of the opening rendered much dilatation of it dangerous. It was impossible, therefore, to extract the encysted portion entire. Attempts to crush it by means of lithotrite or forceps failed. A chisel was guided through the orifice of the diverticulum and laid upon the stone; elastic counter-pressure was afforded by Petersen's rectal balloon. The calculus was then cut through by repeated blows with a mallet. After many shiftings of the pieces, and sections of them in every direction, the stone was chiselled into sufficiently small fragments to allow of their being extracted through the orifice. The wound rapidly healed, and the patient left for the country in six weeks without an untoward symptom.*

* 'Lancet,' Nov. 17th, 1888.

Rare Inflammatory Outgrowths from the Vesical Mucous Membrane.

Syphilis.—The possible though rare occurrence of syphilitic conditions of the mucous membrane should not be overlooked. I have no cystoscopic experience to record.

CASE 35. *Condylomata (?) of mucous membrane.*—B. R.—, æt. 23,* was admitted under Mr. Cooper into the London Hospital with a stab wound of the buttock. After death the stab was found to have divided the sacro-sciatic ligament, the internal pudic artery, nerve, and part of the vein. The side of the bladder was also punctured, below the peritoneum. A Hunterian chancre was found on the penis, shotty glands in the inguinal region, and enlarged lumbar glands. *Elevated patches were found on the mucous membrane of the bladder resembling condylomata.* Peritonitis, diaphragmatic pleurisy, &c.

Bilharzia Hæmatobia in the Vesical Mucous Membrane.—Such cases used to be very rarely met with in Great Britain, but since the South African and Egyptian campaigns soldiers and others returning home affected with the disease have applied for relief of the hæmaturia evoked by the parasite attacking the urinary tract. In the earlier stages the cystoscopic appearances are those of swollen and blurred mucous membrane

* Extracted from the post-mortem records of the London Hospital for 1879, No. 207.

due to cystitis ; the surface is patched with multiple extravasations, which are often punctiform. Later, definite growths* of the nature of inflammatory new formations appear springing from various parts of the bladder, and ultimately epithelioma may attack this new formation,—probably produced by the irritation of the parasite.† The following cases have been under my observation.

* Cf. R. Harrison, “Urinary Organs from a Case of Bilharzia,” ‘Path. Trans.,’ vol. xxxviii, 1887, p. 191. “Walls of the bladder were found full of small tumours filled with ova.” Also Fred. S. Eve, ‘Path. Trans.,’ vol. xxxix, 1888, p. 184, “Springing from the floor is a flocculent fungoid growth ; a larger growth springs from the much thickened anterior wall. Microscopically the fungoid growths were of the nature of inflammatory new formations. On their surfaces were masses of eggs and egg cases of the parasite.”

† Compare Dr. Thomas Harris (Manchester), ‘Path. Trans.,’ vol. xxxix, 1888, p. 183. “Microscopically it was found that in addition to the very large number of ova of *Bilharzia hæmatobia*, there was also present a large epitheliomatous growth sprouting into the interior of the bladder, the cavity of which organ it had, judging from the half available for examination, almost entirely filled. The bilharzia ova were not present in the growth, but at its base,—a large number existing in the surrounding mucous and submucous tissue.

“No history could be obtained of the case, except that the man was believed to have suffered for many years from the bilharzia affection, and the malignant disease was not suspected during life. The case appears to be interesting on account of the possible connection of the malignant growth with the bilharzia affection. It is quite possible that malignant disease may have been occasioned by the irritation produced by the bilharzia ova,

CASE 36. *Cape hæmaturia ; peri-cystitis ; punctiform hæmorrhages at base.*—R—, æt. 20 (hospital case), had suffered from Cape hæmaturia for five years ; came under my observation September, 1887, with symptoms of perforation of the bladder after severe exercise. He recovered, and on discovering that he was passing large quantities of ova I examined him cystoscopically and found the entire base spotted and blotched with hæmorrhages, doubtless the sources of the bleeding, originated by the bilharzia. I have seen the man lately, he still passes ova in large quantities.

CASE 37. *Cape hæmaturia ; carcinoma of bladder.*—R H— (hospital case), had suffered from a recognised Cape hæmaturia for two or more years. When he came under observation he was passing a large quantity of blood, and sank soon afterwards. On post-mortem the bladder was found to be full of nodular masses of epithelioma, which arose chiefly from the walls, leaving the base free. I could not discover any ova either in the superficial or deep parts of the growth, although competent observers had detected them in the urine some time before the symptoms increased in fatal severity. Secondary growths existed in the glands of the pelvis and lumbar region. The liver was largely implicated.

and that whilst usually the effect of the ova in the mucous membrane of the bladder is only to cause the production of an inflammatory granulation tissue, in this case the irritation had occasioned the development of an epithelioma."

Precancerous Conditions of the Vesical Mucous Membrane.

It is generally admitted that precancerous conditions of surface are sometimes observed upon the tongue, mammary areola, and prepuce. I believe that the electric light has enabled one to recognise analogous conditions of the mucous membrane of the bladder. Before describing therefore the cystoscopic appearances of the various tumours which affect the bladder, it will be pertinent to draw attention briefly to a condition of mucous membrane which appears in rare instances to presage the formation of a malignant growth. Usually the vesical tumour is already well developed when the patient comes under medical observation, for in the large majority of cases the early stages of the growth are most insidious, and evoke few, if any, of those symptoms which would attract attention to the bladder. The sudden, painless, and often profuse hæmaturia which is so characteristic a feature of the disease is perhaps the first traumatic check to the rapid increase of the tumour, and marks its date of puberty rather than its birth. Patients have,

however, come under my observation who have presented all the symptoms of vesical growth, and yet I could discover no tumour by means of electric light. Doubtful of my negative diagnosis, I have repeated the examination more than once, but with the same result. Two of these patients have already returned to me, and in each I have been able to discover and watch the development of a vesical cancer. I have lately had three cases presenting the same clinical features and cystoscopic appearances, and I have been forced in each to give a most guarded prognosis in consequence.

The first anomalous case I saw was the following :

CASE 38. Incontinence of two years' duration ; ataxic symptoms. Hæmaturia ; cystitis. Negative examinations with the cystoscope ; subsequent development of carcinoma.—Mr. A. W—, æt. 39, consulted me in September, 1888. He had been under the care of Dr. Sparrow, of Southsea, who had diagnosed polypus of the bladder. His history is as follows :

Patient had a very slight attack of syphilis in 1875. Was quite healthy up to two years ago. He then noticed that he wetted the bed a little during the night ; the incontinence increased rapidly, but only took place at night. He soon began to suffer internal spasmodic pains of great severity, corresponding to the position of the inferior angle of the left scapular bone ; the spasm would last about half a minute, and he would have to clasp his arms across his chest and rock himself to and fro to obtain relief. Strychnia and belladonna relieved these pains, but did not cure them. This spasmodic pain always made him urinate, or attempt

to do so, even though he might just previously have emptied his bladder. His bowels were always relaxed, stools were passed twice or thrice a day. In February, 1888, four months after the onset of the spasmodic attacks, he passed a stream of blood at the end of micturition. Cystitis rapidly supervened. In September, 1888, when I first saw him, his condition was as follows:—"Urine is murky with pus, the stream finishes with darkish blood. Patient suffers no pain on micturition, passes water only four times a day. Residual urine amounts to six drachms. The rectum is free, the anus is perfectly patulous, the bladder wall is supple; prostate is small, the lobes hardish, but well differentiated. He has no knee-jerks, pupils are unequal and immoveable. He sways slightly when he stands with his eyes closed."

I was inclined to regard the case as vesical atony of spinal origin, probably tabetic, the onset symptom of incontinence, the loss of knee-jerks, the pupil fixity, the history of syphilis, somewhat favouring the view. Cystoscopy:—"The entire surface is inflamed and of a dull reddish hue. On the posterior wall is a diverticulum, the edge of which is sharply defined by a deposit of muco-phosphatic incrustation. No stone or tumour to be discovered. The medium became rapidly bloody, although it was repeatedly washed out." I was not satisfied with the result of my search, so I re-examined under ether, but could find nothing more beyond a glazed, spongy posterior wall and the diverticulum. Vesical irrigation relieved the blood and muco-pus greatly, and in October I again passed the cystoscope, Mr. George Pollock being present and examining the bladder with me. The cystitis had cleared up very markedly, the diverticulum appeared as a sharply defined dimple, its calcareous edge was absent. I could see no trace of growth. I therefore dismissed my patient with a catheter and a solution for washing out the bladder. He returned four months after in better health, but passing a good deal of phosphatic debris and muco-pus. I offered to perform a *boutonnière*, and treat the bladder as an abscess, and he consented. On introducing my finger I found to my surprise an irregular, hard, slightly raised patch of growth, the area of which was equal to a five-shilling piece, situated on

the posterior wall, immediately behind the interureteral bar. It was not in the form of a tumour. It was rather an ulcerating, shreddy epitheliomatous ulcer. He was greatly relieved by the drainage, but died suddenly one morning a month after.

On carefully considering the details of this case, I could not but suspect that the fret and irritation of the residual urine and cystitis had induced a carcinomatous change in the mucous membrane. I was strengthened in this belief by another and similar case.

CASE 39. *Incontinence; ataxic symptoms; hæmaturia. Cystoscopy revealing a nodule of doubtful character on the mucous membrane.*—Mr. L—, æt. 40, under the care of Dr. Alfred Scott, of Brighton, who kindly sent me this patient in May, 1889, with a diagnosis of probable vesical growth.

Family history good, has had a mild specific attack (?). Five years ago he began to be troubled with nocturnal incontinence, which lasted eighteen months. During this period he got extremely thin, he passed water every hour and a half in the day; the urine he describes as being thick, sticky, and pale in colour; the incontinence ceased but the cystitis continued. Two years after the onset of the symptoms (*i. e.* three years ago) he passed a small phosphatic calculus, after which his urine became clear as sherry, and he remained well for some time. Eighteen months ago he began to pass bloody urine and much muco-pus. He consulted a medical man in London, who, finding residual urine, washed out the bladder with nitrate of silver. The mucus and blood left him for a month, but returned worse than ever. He continued to pass phosphatic calculi and bloody muco-pus until I saw him.

Patient now suffers "fixed uneasiness" at the neck of the bladder, and has shooting pains in the limbs. The bowels are troublesome; he goes to stool thrice every morning. The sexual

capacity and power are good. There are no knee-jerks; he sways slightly in walking with his eyes shut. There is inequality and immobility of pupils. Residual urine amounts to four ounces. Urethra devoid of sensation until the prostatic section is reached. Anus patulous. Prostate soft, lobes of fair size. Bladder supple. Urine is passed clear but finishes with blood. "If he is having a stone attack the blood is uniformly mixed and profuse."

Cystoscopy.—"I have rarely seen a mucous membrane of so vivid a colour before, the mucous membrane being of a bright glazed purple. Here and there it is pouched into deep depressions, while over the openings hang filmy curtains of mucus and muco-pus. A small phosphatic stone (which he passed next day) and patches of white phosphatic débris add to the grotto-like appearance of the pouchings. On the left lateral wall is a very small nodule of a suspicious aspect. The mucous membrane surrounding it is deeply injected. There is no projecting tumour to be seen. I believe this nodule to be a commencing epithelioma, induced perhaps by the irritation of the long-continued bladder catarrh and residual urine."

I have had further opportunities of studying gradual visual changes in a patch of mucous membrane affected by carcinoma. The following case will serve as an illustration.

CASE 40. *Hæmaturia, cystoscopy revealing a russet-grey growth and an altered mucous membrane. Removal of the former by suction and development of cancer in the latter.*—Mr. O—, æt. 56, kindly sent me by Mr. Travers Stubbs. Five weeks before consulting me, being in perfect urinary health, he suddenly and without warning passed a quantity of coffee-coloured urine. He suffered no pain, but had a tenderness in the right testicle. Since this time the urine has varied in its aspect; now and again it has been quite clear for a day or two, then it has become very dark. He has seen a physician, who said the blood came from the kidneys. On passing the incandescent lamp cystoscope a pecu-

liar russet-grey lobulated growth (?) was seen to be hanging from the posterior wall of the bladder, and to be swaying freely upon a pedicle (Fig. 29). The mucous membrane in the immediate neigh-

FIG. 29.



bourhood had an injected nodular appearance, extremely suggestive of commencing carcinoma. The colour of the hanging body was very puzzling, for in my previous cases the growths had appeared more or less florid or white. As there was a difference of opinion among those present as to its nature, I considered how it could be removed without a cutting operation. I passed a large lithotritry tube and directed its eye towards the place where the tumour had been seen. The india-rubber ball was then attached, and suction made. Once or twice the eye was felt to become suddenly blocked, but on withdrawing the tube a little way its patency became re-established by the obstructing body slipping out. The third attempt was successful, and a large, brownish, grey-looking body was brought away in the eye and the body of the tube. It looked like an old blood-clot. On section it was subsequently found to be necrotic growth (?) and blood-clot. The cystoscope was re-introduced and the diseased site re-examined. There was no bleeding. A patch of stunted processes (atrophied villi) was seen where the stalk had been attached. As operative interference was contra-indicated by the cystoscope, injections were resorted to and the hæmaturia subsided.*

* Recorded in the 'Brit. Med. Journ.,' Sept. 22nd and Oct. 13th, 1888.

Three months after this examination the patient visited me, looking hale and hearty, and declaring himself in the best of health. His general condition gave no indication of carcinoma, and I doubted its existence, believing I had been optically deceived as to the nature of the group of nodules on the mucous membrane. I therefore re-examined him, and was somewhat astonished to see that the group of isolated nodules had grown into a confluent walnut-sized tumour, which was deeply cleft, lobulated, and of a gelatinous aspect (Fig. 30), a growth which I at once recognised as a succulent epithelioma.

FIG. 30.



The appearance and feeling of perfect health in vesical carcinoma is often and perhaps happily deceptive both to patient and practitioner.

I shall now give an undecided case as an example of the difficulty the cystoscopist may be placed in. Unable to see any projecting tumour, growth, or indeed any very definite change of the mucous membrane ; certain (from the obstinate character of the symptoms) that some radical alteration is in progress, the surgeon may be pressed for his opinion as to the probability of carcinoma. Anxious not to condemn his patient upon suspicion only, aware, on the other hand, that he may hereafter be credited with a false diagnosis, he will, I believe, be acting wisely by simply declaring the bladder to be free from any projecting growth or tumour, and by stating that operative interference is not at present called for. At the same time he will do well to hint that such conditions of mucous membrane are liable to degenerate into carcinoma, and that a re-examination at the end of three months is advisable.

CASE 41. *Hæmaturia ; incontinence ; cystitis ; negative cystoscopy.*—Mr. M—, retired naval officer, æt. 56, “ was healthy up to two years ago, when on returning from a walk he noticed his urine darkish brown. No clots, no pain ; blood intimately mixed. For six months the patient was free, then fluid blood and clots were passed. He had no pain, no frequency. Six weeks after another attack of arterial hæmorrhage supervened. One year and four months after the onset of hæmaturia he began to suffer from frequency, passing water every hour in the day, and every

hour or two hours at night. He experienced no pain, only a heaviness and pressure in the suprapubic region. He then suffered from incontinence of urine, though he still retained some power of expulsion. In December, 1888, he consulted Mr. Paul Swain, of Plymouth. He was then passing mucus and blood in his urine; but with washing out the bladder as prescribed by Mr. Swain all blood and incontinence ceased. After passing no blood for six months he was kindly referred by Mr. Swain to me for a cystoscopic examination, which I have entered in my note-book as follows:—"The bladder is free from stone or tumour. Its capacity is average, its mucous membrane is lissom, except towards the right base, where a localised chronic cystitis is evident. There is at present no ulceration; the superficial epithelium has scaled off, for there is an unhealthy glaze instead of a glistening surface. The fasciculi are abnormally large and powerful, pointing to mere irritability in the past or due to some stimulus which has been present." Prostate small. Residual urine one ounce. The patient was advised to have the examination repeated in six months.

Tumours of the Bladder.

It will be convenient to divide this section into villous papillomata and benign growths, sarcomata and carcinomata.

(a) *Villous Papillomata*.—Growths of the bladder, as seen by the electric light, often form objects which Dittel has justly designated as truly charming (*entzückend schön*).^{*} More especially worthy of his praise are certain forms of villous

^{*} Quoted from Nitze, *op. cit.*, p. 201.

papillomata — those whose long and delicately branched leafy processes, rose-red in colour from their capillary blood, float freely about in the vesical water, trembling at every movement of the beak of the cystoscope, and swaying at every eddying rush of the ureteral streams. The entire picture is like some small aquarium with an attached sea anemone moving its delicate tentacles around in search of prey. “If the prism is placed near the villi, their vessels with every trunk, even to the finest branchlet, can be seen” (Nitze). If these should be so far damaged by the examination as to bleed, little streams of florid blood may be watched issuing from the wounds and gradually mixing with the medium around.

I have already quoted one case (p. 91) in which the surface of the tumour was seen to be covered with long leaf-like villi. The villi differ, however, in length, breadth, and colour. Some are so stunted as to appear like blunt and diminutive cones, whilst others again are so thin and long that they resemble pennants. Some are colourless and necrotic, evidently about to be cast off, whilst others again may be caked with deposit of phosphatic grit or darkened blood. Sometimes long tails of mucus may stream from the surface of

Photo-Print 6.



FIBROPAPILLOMA WITH MUCUS TAILS,
ON LEFT SIDE OF BLADDER.
(CLAY MODEL.)

the individual villi and increase by many times the real length of the fimbriæ.

CASE 42. *Hæmaturia of thirteen years' duration. Sudden cessation on the development of mammary cancer. Recurrence after excision of the breast. Cystoscopy revealed a papillary fibroma with mucus tails; removal; recovery.*—Mrs. C—, æt. 60, under the care of Dr. Field, of Bath, and kindly referred to me by him with a diagnosis of vesical growth. Thirteen years ago the patient was in perfect health. At that date she had a sudden and causeless attack of hæmaturia which ceased as suddenly, but only to return in a few days. The bleeding then became intermittent, the colour varying from coffee brown to florid red. No pain; no frequency of micturition was experienced. Nine years ago these regular and almost periodic attacks suddenly ceased, and a carcinoma of the right breast rapidly developed. Mr. Scovell Savory confirmed the diagnosis, and the gland and its contained scirrhus mass was amputated. Four months after the operation wound had healed the hæmaturia reappeared and intermitted with its former characteristic persistency. The bleeding lately has been continuous. The colour of the urine is now of a deep maroon. There is no frequency and no pain, but the continued loss is beginning to tell upon the patient's strength and energy.

Cystoscopy.—A sessile growth the size of a small hazel-nut was seen to rise from the left side of the floor of the bladder outside the trigone and in front of the left ureteral orifice. The size of the tumour was much increased by a number of blunt, clear, jelly-like processes which sprang from the surface and rose vertically in the bladder water (mucus tails) (Photo-print 6). Two thin scarlet streams of blood issuing from between these white trunklets flowed sluggishly away like two thin red bannerets, and curiously enough did not appear to mix quickly with the boracic acid medium. The patient consenting to operation, I dilated the urethra, and found the tumour placed exactly where I had seen and modelled it. I also discovered several small splashes or patches of the same kind of growth which had been hidden by the largest portion. The main piece, the size of a monkey-nut, was

dissected cleanly off the muscle walls by means of forceps and scalpel; the small splashes were scraped off by means of a Volkmann's spoon. No reaction or incontinence followed, the patient leaving within the fortnight. Mr. D'Arcy Power reports, "Microscopically the main tumour is a very vascular fibrous growth covered by a thick layer of tessellated epithelium. The connective tissue is so loose as to be of a myxomatous type, and contains a large number of round-cells. It is clearly non-malignant.

The following case, which is recorded by Dr. Nitze, is very interesting, as the growth was found in an unusual position on the anterior wall.

A patient, æt. 50, had suffered for two years from vesical symptoms. When the bladder was full the urination commenced with a strong continuous current. Gradually, however, as the evacuation progressed, so the act became difficult, and in spite of energetic pressure and straining, declined into an intermittent stream, which finally was completely arrested by an obstruction which no amount of pressure could overcome. The patient was compelled to relinquish his efforts with the feeling and conviction that the bladder had not emptied itself. Hæmaturia was never seen; the urine was completely clear. The patient introduced a catheter, and withdrew in its eye a fragment which Professor Küster recognised as a villous process. The endoscope was introduced,

and directly the prism entered the bladder a dependent growth could be most clearly distinguished immediately above the normal fold of the urethral orifice. It was composed (Fig. 31) of a large

FIG. 31.



number of villous processes, for the most part of a delicate rose colour. In the centre of some of the larger processes fine vascular branches could be seen.

By gentle movements of the cystoscope it was proved that the growth was attached to the right half of the anterior wall, $2\frac{1}{2}$ cm. to the right of, and external to, the urethral orifice, also that it did not overlap the middle line. Its size was correctly estimated; but it was more difficult to determine whether the growth was stalked or whether it was attached by a broad basis.

The discovery of the position of the tumour at

once explained the cause for the abnormal symptoms of micturition; so long as the bladder was full, so long did the growth remain suspended above and out of the way of the urethral orifice; in proportion, however, as the urine diminished so the growth descended until it was finally caught in the outflowing stream and the orifice plugged by it.

Prof. von Bergmann performed *sectio alta* and corroborated the cystoscopic examination in every detail. The growth was like a walnut-sized raspberry, and pedicled.

CASE 43. *Hæmaturia of one year's duration*.—J. L—, æt. 62, under the care of Mr. Heycock (notes by the House Surgeon, Mr. F. H. Norvill), admitted in May, 1888. Hæmaturia had been present for one year, the amount of blood present in the urine varying greatly. Latterly clots have appeared. No pain. No residual urine. Cystoscopy. Bladder capacity small; much blood. Four ounces thrown in. Cystoscope inserted; pendulous growth like Nitze's villous papilloma (Fig. 31) discovered on posterior wall. I noticed that blood issuing from the tumour fell to the base of the bladder, and rendered the deeper layers muddy. By elevating the lamp I was able to get out of this murky layer, and see moderately well in the upper clearer layers. Operation was declined.

Not infrequently the surfaces of carcinomatous and sarcomatous tumors are covered with true villi,* but judging from the cases I have seen

* The surface may be so deeply ulcerated that the necrotic

there seems to be a greater tendency for the individual villi to degenerate and drop from the parent stem in the malignant-based group than in the benign (compare case, p. 92 and footnote).

CASE 44. *Hæmaturia of two years' duration. Cystoscopy revealed a villous-covered, carcinomatous growth. Removal, recovery.*—Mrs. B —, æt. 43, under the care of Dr. Frank Oldfield, who asked me to see the patient, who, he believed, was suffering from a malignant growth. This lady had been under treatment by a homœopath for two years without any examination being made. Florid blood had been passed at the end of clear micturition. Much pain had been suffered; a fetid urethral discharge was sometimes observed; usually the urine was coffee-coloured. Cystoscopy:—“Bladder wonderfully healthy, except at the opening of the left ureter; at this spot there is a monkey-nut sized growth of a pinkish gelatinous aspect. It slightly overlaps the orifice. This tumour is evidently of soft consistence, for its abutting and partly overhanging surface has become quite concave, hollowed out doubtless by the constant action of the outflowing stream of urine from the ureter. I watched several emergent jets strike and churn within this little alcove, and sweep on to toss and buffet the fragile villi with which the growth was sparsely covered. Ulceration has also been at work and left its mark, for deposits of phosphatic grit are plainly visible in the cracks and dimples on the surface.” (Photo-print 1, frontispiece.)

Fig. 32 is introduced to represent the appearance, surface, and position of the growth. The model was made regardless of its real size.

Operation being permitted, I dilated the urethra, and found the growth to be polypoid and pedicled, and in the above-mentioned position. Having snared it, I cut through the stalk. The

tags may resemble true villi. It will be noticed that the former are usually white or whitish-brown, while the latter are vascular.

FIG. 32.



patient made a rapid recovery. Mr. D'Arcy Power reports: "The tumour is a columnar-celled carcinoma, which has set up a great deal of irritation in the surrounding tissues. It has a curiously well-marked papillary appearance."

CASE 45. *Hæmaturia*.—G. M—, æt. 63. Cystoscopy: "The entire surface seemed apparently changed into villous-covered carcinoma; much blood-clot present. On more careful examination, however, it was evident that the surface was shreddy in some parts, whilst in others it was obviously covered by coarse veal-fibred stuff which is produced by the inflammation stripping up deeper surface planes of the growth into thick fasciculi.

CASE 46. *Hæmaturia*. *Villous-covered mixed-celled sarcoma*.—On examining the bladder of a patient, æt. about 44, who had been suffering for a few months from painless and profuse hæmaturia of typically vesical origin, I discovered a small villous-

covered growth. The patient brought with him a bottle of pieces of growth he was passing. These I submitted to Mr. D'Arey Power, who reported the growth to be a mixed-celled sarcoma, consisting of round and small spindle cells. I advised operation, but the patient refused, and I have since lost sight of the case.

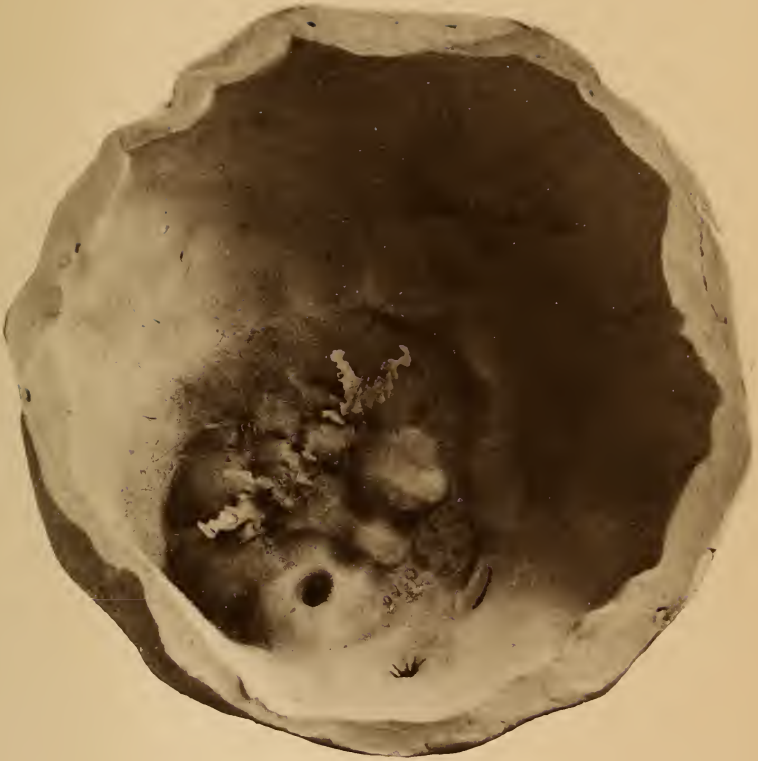
(b) *Sarcoma*.—Sarcoma cannot be distinguished cystoscopically from carcinomata. Both usually appear as distinct tumours projecting from the wall into the cavity of the bladder. Sarcoma is said to be extremely rare,* and to disprove this statement I have collected and made statistics of fifty cases.† The following case is an example of the disease, as seen by electric light. (Compare Case 46.)

CASE 47. *Profuse and uncontrollable hæmaturia of two years' duration. Cystoscopy revealed growth over right ureteral orifice; sloughing. Microscopy of detached pieces.*—Mr. H—, æt. 53. For many years the patient has been of intemperate habits. He came to me in November, 1888, complaining of hæmaturia. His history is as follows:—Two years ago after a slight attack of bronchitis florid blood appeared in the urine. He had no pain or frequency of micturition. The hæmaturia was at first intermittent but soon became continuous. On attempting to examine him I found myself unable to obtain a clear medium. I persevered with the washing, but the blood increased instead of diminishing. I postponed the cystoscopy, but after waiting some time, and a further trial, I was forced to desist until the blood lessened. No medication seemed to have any control over the hæmorrhage. The

* Sir H. Thompson, 'Tumours of the Bladder,' 1884, p. 62.

† Author, "Sarcoma of the Urinary Bladder," 'Pathol. Trans.,' vol. xxxix, p. 171, 1888.

patient brought sample upon sample of what appeared to be almost pure florid blood. For three months I waited patiently for a favorable opportunity, the patient absolutely refusing all operative interference or drainage. Acute cystitis set in, and the bleeding abated, but frequency of urination appeared, and he was obliged to pass water every half-hour, and at night he made efforts nearly every fifteen minutes. A sudden and exhausting attack of diarrhœa supervened in January, 1889, whereupon the hæmorrhage rapidly subsided, and I introduced the cystoscope, and was able to make a leisurely examination of the disease. "The mucous membrane covering the posterior wall around and behind the orifice of the right ureter is seen to be transformed into a low-lying nodular growth. The projections are of various sizes and shapes, their colour is uniform whitey-brown, relieved here and there by small clots of a dark crimson or black currant jelly colour, which are plugging (and thus mark) the sources of the recent points of hæmorrhage. Tabs and tags of necrotic growth stream from the upper part of the growth, whilst scattered irregularly over the surface are a few villi. The right ureteral orifice is evidently implicated by the growth, for it is a thick-walled funnel. (Photo. 7). The left ureter is pumping rapidly: perhaps the left kidney is doing double duty for a partially obstructed right kidney." *Per rectum* the bladder is supple. I advised that no operation should be performed until it was time to drain the bladder. After this, Mr. H— seemed to have taken a turn for the better, exhibiting one of those curious lapses of symptoms which are sometimes seen in vesical malignant growth, but he again got worse and in June I again re-examined him. "There is now (June 5th) a great increase in the size of the nodules which were seen in January to be overhanging the right ureteral orifice. Masses of growth project now so much as to encroach greatly upon the cavity of the viscus. Their colour is whitish, their surface furry with superficial ulceration." *Per rectum* a decided thickening could now be distinguished on the left side behind the prostate; the latter was soft and unimplicated. The patient again rallied, but is now failing, and will soon require drainage to relieve frequency. He does not suffer pain.



ULCERATING SARCOMA OVER RIGHT URETERAL ORIFICE.
(CLAY MODEL.)



(c) *Carcinoma*.—In rare instances of cancer of the bladder no tumour projects into the cavity of the viscus, but the disease takes the form of a (carcinomatous) infiltration of *large areas*, if not of all the muscle wall. In this class the cystoscopist often fails to see what his finger, introduced *per rectum*, would at once reveal. I have lately watched three such cases, and the bladders are now in my possession. The mucous membrane in each is faintly nodular, like carcinoma *en cuirasse*, the slight projections are obscured by the muco-phosphatic deposit of chronic cystitis—the deposition of which had been incited and localised by the superficial ulceration of the nodular tongues which have extended to the mucous membrane from the parent stratum beneath. But in attempting to demonstrate the value of the electric light in vesical carcinoma, it would be obviously useless to deal with this class, and as obviously practical to divide the subject into three groups.*

1. Carcinomatous tumours possessing pedicles.
2. Sessile carcinomata.
3. Invading carcinomata.

* It is, I believe, at present impossible to diagnose visually between epithelioma and encephaloid carcinoma.

1. *Carcinomatous Tumours possessing Pedicles.*
—As pedicled vesical growths are the most favorable for operative interference I examined carefully 100 specimens of cancer of the bladder to ascertain the frequency with which a pedunculated carcinoma would be met with—believing that such an investigation would be of value in deciding the advisability of interfering with carcinomata. I found pedunculation extremely rare—3 per cent.*

Since I have investigated the early stages of cancer by means of the incandescent lamp cystoscope I have found that stalked cancers are not so uncommon, and I have realised that such statistical observations are almost worthless upon this point, if made upon the dead and—if I may use the term—completed subject. Five pedicled carcinomata, three of which† I have just quoted, have passed through my hands in the last year, which gives a percentage of nearly 20 per cent. This will probably be proved to be even higher, as the examination is made in still earlier stages.

(I am indebted to Mr. Heycock for permission to publish the following case, and to Mr. F. H. Norvill, house surgeon, for the notes.)

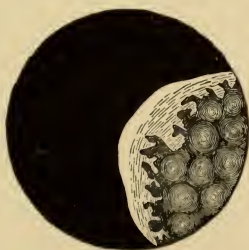
* Author, Jacksonian Prize Essay, 1887.

† Case 8, p. 107, Case 33, p. 147, Case 44, p. 167.

CASE 48. *Occasional hæmaturia for three years. Cystoscopy revealed a pedicled growth. Removal by écraseur. Recurrence in ten months' time.*—Mary B—, æt. 55, had suffered for three years from occasional hæmaturia. When patient was first seen (December, 1887) she was troubled with frequency of, and some pain on, micturition. The urine was turbid with muco-pus, it was evacuated fifteen times in every twenty-four hours. Patient stated she could only pass water when on her back. The bladder was carefully sounded and found to contain no stone; no growth felt; residual urine two ounces and more. Patient's condition improved with vesical irrigation, the nightly use of the catheter, and balsamic medicines. The urine continued free from blood until March, 1888, when several large clots were passed. Mr. Heycock now recommended exploration for vesical growth, and kindly gave me leave to explore the bladder with the electric light before dilatation of the urethra.

The patient was put under chloroform, the bladder washed out, and clean water substituted for the hæmaturial urine; the cystoscope was introduced and the right side of the trigone shown to be quite free. On turning the cystoscope on to the left side and slightly directing the prism towards the floor, a walnut-sized growth was discovered; it certainly presented a remarkable

FIG. 33.



(The mucous film has been omitted.)

appearance (Fig. 33), its surface was slightly nodular, but the cracks and crannies were filled with a glistening white layer of phosphatic deposit. Floating away from, but partially attached

to the summit was a cloak of clear mucus, which wavered at every current set up by the movements of the instrument. The urethra was dilated, and the position and size of the growth verified by digital examination: it was found to have a well-defined stalk, the occurrence of which explained the difficulty the patient experienced in passing water in the upright position, for the pedicle was long enough to allow the tumour to get sucked into the out-flowing current and thus partially to cork the urethral orifice.

A week later Mr. Heycock re-dilated the urethra, seized the growth with a pair of forceps, and slipped the loop of a wire *écraseur* over it. The pedicle was readily cut through and the tumour removed. It proved to be as large as a walnut. It was firm, and encrusted with a phosphatic deposit.* The bleeding, frequency, and pain ceased; the incontinence gradually diminished, and the patient left the hospital a fortnight after, relieved of all her symptoms. Mr. D'Arcy Power reported upon the growth as follows: "The sections of this vesical tumour present under a low power of the microscope a large number of cells embedded in loculi formed by connective tissue. In the deeper portions of the growth there is an infiltration of small round-cells, the result of continued irritation of the tissues. Under a higher power of

* In the previous edition (1888) and in the 'British Medical Journal,' April 14, 1888, this tumour is mentioned as being a firm fibro-papilloma. No microscopical sections were prepared, for the *pedunculation* and the fibrous aspect of the growth when divided seemed so typical of a fibro-papilloma, and so opposed to carcinoma, that the naked-eye appearance was relied upon. The tumour was, however, prepared and bottled. When the patient returned, and multiple malignant growths were seen to have sprouted from the scar, I sent the specimen to Mr. D'Arcy Power, of St. Bartholomew's, without any clinical history, in order to explain the recurrence of an apparently benign growth in a malignant form, for it was suggested to me that probably irritation and tearing of the *écraseur* had induced a carcinomatous change. (Compare report.)

the microscope (Crouch, obj. $\frac{1}{6}$, oc. No. 2) the cells contained in the loculi have all the appearances of being derived from epithelium. They are large and polygonal in outline, are closely pressed one against the other, and they bear a distinct resemblance to the normal epithelium of the bladder. The septa forming the alveoli consist of newly-formed fibrous tissue, which does not send in processes between the individual cells. The blood-vessels lie in the fibrous tissue of the alveolar walls, and are possessed of well-defined coats. I have therefore no hesitation in assigning the growth from which these sections were taken to that class of soft alveolar carcinomata which are usually known as medullary or encephaloid cancers."

For ten months after the removal of the growth the patient was free from all pain, frequency, or blood, but after this interval both blood and mucus reappeared in the urine. She returned to the hospital, and I was allowed by Mr. Heycock to make a second examination. Cystoscopy: "Not only has the growth recurred at the site of the tumour which was previously removed, but its character has changed. It is now a sessile gelatinous-based epithelioma with a cupped taggy centre sprinkled with glistening white phosphatic deposits. More anteriorly I find an isolated second deposit of recent origin. Moreover, on the right upper wall a small threepenny-piece-sized deposit is seen." This multiple deposit contra-indicated any interference, and the patient was discharged.

On page 107 I have detailed the history of a case in which a pedunculated encrusted growth momentarily deceived me into believing that I had to deal with an encysted calculus. The sequel of this case is of such vital importance, from an operative point of view, that I introduce it here to show how very grave the operative prognosis of vesical carcinoma is, even when the growth

has been entirely ablated, and that under the most favorable conditions.

CASE 8 (continued from p. 107). On inserting my finger through the suprapubic wound into R—'s bladder, I found a large, walnut-sized growth *with a quill-thick pedicle* attached to the posterior upper wall. I clamped the slender peduncle with a Wells forceps, and cut the tumour away, extracting it through the wound. I then everted the stump and the surrounding mucous membrane by slight traction upon the forceps, so as to examine its base and to make sure of removing every trace of the growth. The stump was burnt through with a Paquelin cautery knife, and the site well seared. The entire bladder was thoroughly searched, and proved to be absolutely free from any deposit, visible or feelable. With appropriate drainage the patient rapidly healed, and left the hospital in three weeks. Mr. D'Arcy Power reported upon this growth as follows: "The sections of this tumour resemble in nearly every point the sections from the preceding (Case 48). They only differ in the fact that the alveoli are somewhat smaller, whilst the fibrous trabeculæ are richer in cells. The growth must therefore be considered a soft alveolar carcinoma." In exactly three months the patient returned, complaining that the operation scar was very painful and thick. The scar had evidently become carcinomatous; an ulcerated button of new growth projected from the middle of the scar; the neighbouring skin was greatly inflamed and œdematous.

On passing the cystoscope I was not surprised to see on the corresponding internal suprapubic scar a growth which was a perfect duplicate of the one I had removed three months previously, whilst another sprang from the site ? of the latter. The mucous membrane on each side of this brilliant white, phosphatic-covered growth was elevated into the longitudinal bright red rugæ of acute congestion* (Photoprint 8),—an unhappy augury for the future progress of the growth. The patient could retain half a

* Compare p. 99, and Case 3.



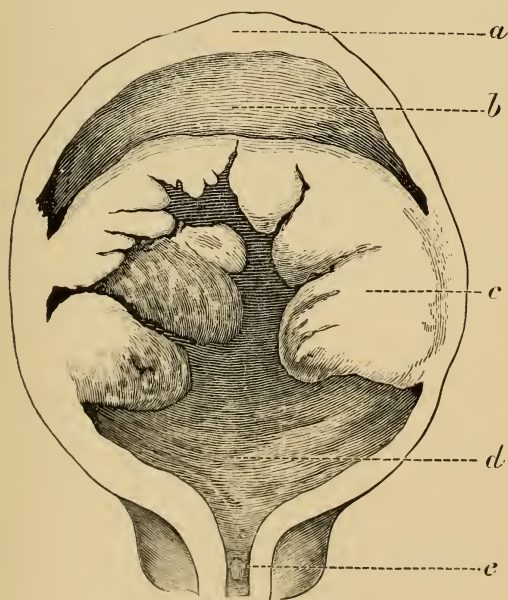
RECURRENCE OF CARCINOMA
IN SCAR OF A SUPRA PUBIC CYSTOTOMY.
(CLAY MODEL.)



pint of urine. He had no pain, no blood, no frequency. In a week's time, however, he complained of a return of his former distressing symptoms, which increased in severity so rapidly that I was forced to drain the bladder by a *boutonnière* four months after the supra-pubic operation, and found it filled with soft carcinoma. Evidently the growth and fusion of the two independent centres had been extremely rapid. The patient died shortly afterwards, worn out with spasmodic pain, which neither supra-pubic combined with perineal drainage, nor free opiates, could relieve.

On post-mortem the entire middle zone of the bladder was filled with soft growth (fig. 34, c). A small free space (b, d) was

FIG. 34.



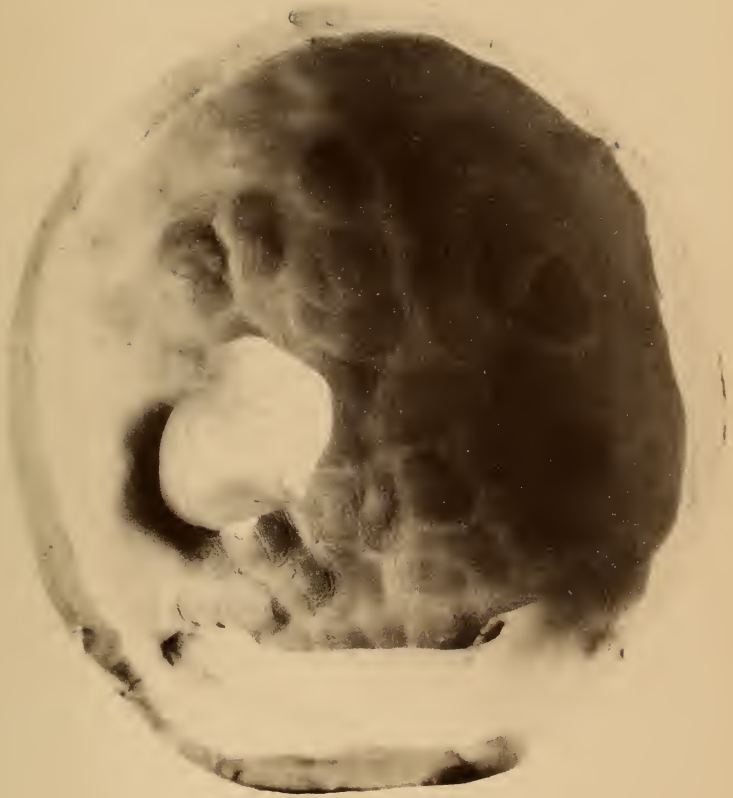
found at the apex and at the base (made very evident in the diagram), but this could only have been potential, for when the bladder was contracted as it was in life, the median tumour en-

croached upon and filled up both these uninvaded portions. No secondary deposits were found.

CASE 49. *Hæmaturia of two years' duration; calculus; lithotripsy. No decrease in the amount of the hæmaturia. Stalked carcinoma.*—Mr. J—, æt. 62, under the care of Dr. Fredk. Simms, who brought the patient to me in October, 1888, with a diagnosis of vesical growth. His history is as follows. He was perfectly sound until two years ago, at which date he suddenly had an attack of painless hæmaturia after long exposure and fatigue. The hæmaturia was typical of growth; a small calculus was, however, discovered and crushed, but the loss of blood continued unabated. He suffers now from no pain or frequency, the hæmorrhage is persistent, occurring after micturition. On examination with the cystoscope, a whitish grey walnut-sized growth, evidently stoutly pedicled, was seen hanging from the right postero-lateral wall above the right ureter (Photo-print 9). Its surface was flocculent. There was no cystitis; the patient was advised that by operation the growth could be removed, but that in all probability it would rapidly recur. I have lately (July, 1889) seen the patient; he is apparently in perfect health. He suffers, however, from slight pain at the tip of the penis and in the perinæum after passing water, induced most likely by the increased growth of the tumour. He has intermittent attacks of bleeding; no cystitis is present.

(2) *Sessile Carcinoma.*—The visual diagnosis of this group is much easier than that of its predecessor. The growth may be in the form of a single tumour, planted more or less irregularly upon a broadish base, or it may exist as a low-lying nodular cancerous surface which affects rather the submucous and muscle tissues than the mucous membrane. The former is the softer, and of a

Photo-Print 9.



STALKED CARCINOMA
ON POSTERIOR WALL OVER RIGHT URETERAL ORIFICE.
(CLAY MODEL)



much more luxuriant and rapid growth, the latter, commencing undoubtedly upon the internal surface of the bladder, slowly implicates the tissues behind it, and becomes ultimately recognisable *per rectum* by means of the finger.* Both these forms in their early stages are difficult to diagnose without the aid of the cystoscope. Without dogmatising upon an experience of twenty-six cystoscopies of vesical growth, I would submit that the base appears more prone to develop this slow-growing nodular cancer, whilst the body of the bladder, with its thicker and looser-textured mucous membrane, seems to encourage a larger and more succulent variety. Carcinoma in any form, unless it be in its earliest and gelatinous looking stage, is usually seen to be of a whitish grey or yellow colour, the more prominent parts of the surface of the growth are almost always ulcerated, tags and streamers of necrotic tissue are noticed clinging to and floating from its sides, whilst a white or grey phosphatic deposit powders the whole, and deeply lines the nooks and cracks between the component lobules. It ought to be remembered that such evidences of destruction of

* Compare page 171, for carcinoma affecting the muscular layer *first* and the mucous membrane second.

tissue are much more frequently observed in the malignant group of tumours than in the benign. Deposition, therefore, of the urinary salts aids not only in stamping the character of the growth but also serves as a landmark for its detection.

CASE 50. *Hæmaturia of two and a half years' duration; cystoscopy revealed a cockscomb-like epithelioma of the right base*—Mrs. L. H—, æt. 61. Kindly referred to me by Dr. Herman. Two and a half years ago blood appeared in the urine. For two or three months previously she had suffered from an aching pain in the suprapubic region. She had no frequency or pain on micturition at first. She has had severe dysuria latterly from the obstruction caused by clots. Cystoscopy revealed a tumour having many pointed papilliform projections planted on a thick and succulent base outside the trigone on the right side of the bladder base. It was too sessile for operative interference.

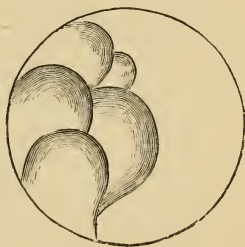
CASE 51. *Hæmaturia of sixteen months' duration. Cystoscopy revealed a subsessile lobulated growth on the right side of the trigone.*—(I am indebted to Mr. Eve for permission to publish this case and to Mr. C. Daniels, house surgeon, for the history). N. C—, æt. 71. In November, 1886 (sixteen months before death), patient noticed that he began to pass blood in his urine, accompanied by pains across his chest, and a cough. He was admitted into the London Hospital July, 1887, under the care of Dr. Samuel Fenwick, and his case is thus recorded :

Patient has been in robust health all his life. No history of syphilis. Has been a heavy beer drinker. Family history of longevity—a fact so often noticeable in carcinoma of the bladder.

Status præsens.—Patient is a well-nourished, powerful man, but anæmic. He passes his water three or four times daily, and gets up at night once or twice for the same object. Urine is of a cerise colour, acid, sp. gr. 1013, contains $\frac{1}{10}$ albumen (due to the blood). Prostate not enlarged. Six ounces of residual urine. No stone or growth to be discovered by sound or microscopical

examination of urine. Hæmaturia, spontaneous and symptomless, of vesical origin; under partial control by means of hæmostatics. No cause ascertainable. He was transferred to Mr. Eve, and after a prolonged stay, during which he ceased passing clots, he was made an out-patient. On January 3rd, 1888, he was readmitted under Mr. Eve with increase of all his symptoms, passing clots of blood in his urine, which is of a uniform, dark, port-wine colour. He micturates five times during the night, and as many times in the day. He complains of slight penile pain and discomfort, but beyond this he is free from suffering. Bimanual examination and an exhaustive search of the bladder and urine revealed nothing. His urine became ammoniacal, depositing triple phosphate crystals abundantly. Attacks of retention due to the impaction of clots in the urethra necessitated occasional catheterism. I was now asked to examine him with the electric cystoscope. The instrument was introduced and turned on to its side, and a sessile lobulated growth was immediately discovered on the right side of the trigone. The lobes

FIG. 35.



were large and deeply injected. Fig. 35 represents the sketch taken. The lobes in the sketch are larger than natural, for they were seen as magnified by the prism. The rest of the bladder was but slightly inflamed. Taking into account the man's age, his extreme weakness from the continued drain of fifteen months' hæmaturia, the position of the growth on the trigone itself (*vide Note, Carcinoma, p. 78*), and its sessile lobulated appearance, it was deemed advisable to leave the tumour undisturbed. The termination of the case justified the non-intervention.

The frequency gradually increased until his sleep became disturbed every hour by a call for micturition. A larger quantity of blood was voided. Clotting caused retention, until at last perineal cystotomy was performed for drainage purposes. On digital examination the right half of the trigone, up to the orifice of the right ureter, was found to be covered with a sessile, lobulated outgrowth, projecting half an inch from the surface. The cystoscopic appearances were thus completely verified.

The patient gradually sank, and on post-mortem examination the condition just described was found. Secondary deposits existed in the liver and kidney. The prostate was unaffected.

CASE 52. Profuse hæmaturia in a diabetic patient. Cystoscopy revealed a nodular epithelioma of the right base.—Mr. G—, æt. 65, who had been under the care of Dr. Wilks and Mr. Evan Llewellyn with diabetes, was referred to me in March, 1889, by the latter, to investigate the cause of a profuse and persistent hæmaturia.

Eighteen months ago blood appeared in the urine, but for once only. A year afterwards a blood-red sediment was noticed, the patient having been quite well in the interval; this deposit increased gradually in amount, its colour changing from mahogany to coffee grounds. He then noticed that after he had passed water he was desirous of passing some more, and the few drops which he then was able, with straining, to evacuate were of bright red blood. He suffered pain for two or three hours after the act. He had no impediment to the stream, which was forcible and full. He passed water once only, at night. This continued until January, 1889, when he began to urinate much blood with the water, but the amount of the former varied. Occasionally when the urine was free of blood he experienced pain at the glans penis.

Electric cystoscopy.—"Large amount of blood present, and continues to pour out from a malignant surface, disregardless of frequent washing. The right half of the trigone is covered with gelatinous, unpraised nodules." It was evidently a similar case to the last. No reaction except a profuse attack of bleeding.

Carcinoma affecting either ureteral orifice is sometimes extremely rapid in its lethal power, doubtless by first throttling the corresponding kidney and then by the extension to that gland of the inflammation from a disintegrating focus situated at the very outlet of its duct. In one case I recently examined, the right kidney was quite healthy though congested, the left kidney was an enormous multilobed sac, the relic of a gland whose output had evidently been long obstructed by a ureteral calculus. Carcinoma, of three months' duration, had produced acute vesical inflammation, which, travelling up the dilated highway, had burst upon the previously distended kidney, and had converted the urine retained there into almost pure pus.

CASE 53. Hæmaturia of five months' duration. Cystoscopy revealed a small carcinomatous growth of the right ureteral orifice. Duration of life eight months.—J. C—, æt. 60 (an out-patient), came to me in November, 1888, complaining of hæmaturia. His history was as follows: Five months ago his urine became thick (lithuria), then clear, then bloody. The blood increased in amount and then vanished. Since then the hæmaturia has been painless, profuse, and intermittent. He appears now a hale, hearty man—has never been ill.

Cystoscopy.—On injecting eight ounces, after the washings had returned clear, the cystostope was introduced and turned over to the right side of the bladder. Upon the floor, near the outer edge of the trigone, a shilling-sized patch of flat whitish

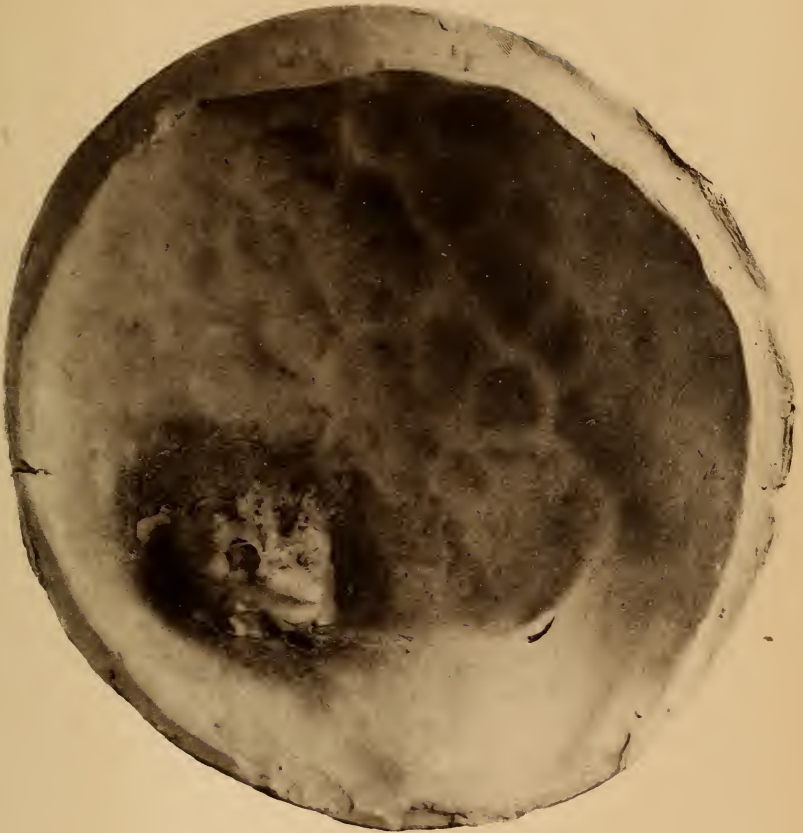
growth with a finely tufted surface was seen. There was a deep purple, congested, and œdematous base, a large vein was noticed running up to the very margin of the epithelioma. The medium was withdrawn, and only three ounces were inserted. On introducing the cystoscope the flat patch was seen to have completely changed its aspect; it was now a definite tumour like a small brazil nut, and it overhung the right ureteral orifice, apparently springing from the upper lip of the opening. The base was red and fleshy; the surface phosphatic, crusted, and taggy with ulceration (Photo. 10). A trickling stream of blood found its way slowly down the irregular furrows on the face of the growth, and poured into the orifice of the right ureter, whence it was turbulently ejected by the swirl of urine propelled from that opening. The growth was so characteristic and the base so sessile that no operation was advised, and the patient died three months after.

This case taught me the value of gauging the depth of growths by introducing first a full amount of the clear medium and then withdrawing a third or a half, so as to allow the mucous membrane to roll itself inward.*

CASE 54. *Pain and irritability of bladder for one month. Hæmaturia for three days. Cystoscopy. Death three months after onset.*—In February, 1889, a feeble old man, J. A—, æt. 75, came to the out-patients complaining that for the last month he had been suffering great pain in passing water, which he felt compelled to do every ten minutes, night and day. Two days before applying for relief he passed blood. Cystoscopy revealed a flattish epitheliomatous ulcer around the right ureteral orifice and along the right side of the trigone. Acute cystitis rapidly supervened, and two months after the examination he died with symptoms of renal suppuration.

* Compare p. 62, Irrigating Cystoscopes.

Photo-Print 10.



CARCINOMA OF RIGHT URETERAL ORIFICE.
(CLAY MODEL.)



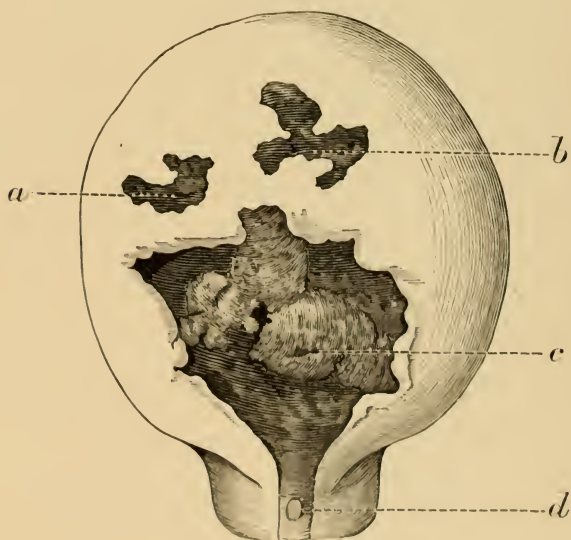
3. *Invading carcinomata—cancer propagated by contiguity.*—With the exception of prostatic invasion, it is rare for carcinomata to attack the *male* bladder from without, but when such does occur, the originating focus lies usually in the gut. As a general rule that portion of the bowel from which the bladder is thus affected, is the rectum, though carcinomatous fistulæ have been found between the bladder and the sigmoid flexure. The question has but little practical interest for the surgeon, and the following illustration is only introduced here to show how obscure such a case may be, and how readily it may be cleared up by means of the cystoscope.

CASE 55. *Colloid carcinoma of gut affecting posterior wall of bladder. Cystoscopy. Gradual increase in size of vesical tumour. Extravasation; peritonitis; death.*—Mr. P—, æt. 45, a patient of Dr. de Gruyther. He was seen in consultation with Dr. Carmalt Jones, and was kindly referred to me by the latter in April, 1888, for cystoscopic examination. His case was as follows:

In the summer of 1887 he had a sudden and severe attack of colic, diarrhœa, and vomiting. After the cessation of these symptoms attacks of diarrhœa became habitual. He soon noticed that his urine issued in a bubbling, whistling manner. The water then became thick and foul, and finally he passed nearly a pint of blood and water. He was sounded by Dr. Carmalt Jones, and a growth or “a something” was detected with the beak, but no stone. The patient then commenced to pass quantities of colloid substance of a yellowish-brown colour, which soon became mixed with pieces of growth. These were examined microscopi-

cally, and the diagnosis of vesical growth was confirmed. He had frequency every hour, but no pain. His urine was fœtid, murky, and the stream finished with blood. I examined him with the cystoscope in April, 1888, and reported that he had a multilobed gelatinous-looking tumour springing from the posterior wall (Fig. 26, p. 90). Bimanual examination allowed me to distinguish a small tangerine-sized tumour, apparently glueing the gut and the back of the bladder together. He continued passing pieces of

FIG. 36.



growth until August 10th, 1888, when he was suddenly seized with an excruciating pain over the lower part of the belly (evidently peritonitis). I was unfortunately away on my holiday, but the patient was sent to the Cancer Hospital under the care of Mr. Elam, to whose courtesy I am indebted for permission to be present at and to quote the autopsy. On opening the body a large suprapubic extra-peritoneal abscess was found. It was full of liquid pus, necrotic tissue, and urine. It communicated by

two ragged holes (*a*, *b*, Fig. 36) with a second sac springing from the apex and back of the bladder. This second sac was full of necrotic growth, which had sprouted into both gut and bladder. The peritoneum had been stripped up as high as the umbilicus. The bladder was found small and contracted; the trigone was quite free, but sprouting from the middle zone of the posterior wall was a tangerine-sized, deeply cleft shaggy growth (*c*, Fig. 35). On making a vertical section through the enucleated pelvic viscera, it was seen that the bladder growth was the vesical end of a large mass which lay between the rectum and bladder, involving both cavities and firmly glueing both viscera together. The portion which had sprouted into and had encroached upon the lumen of the rectum was much larger and much more broken down than the vesical fungation. Mr. D'Arcy Power reports that the microscopy of the growth is nearly the same as that in Cases 48, p. 174; 8, p. 176; 38, p. 154, "but both cells and stroma are undergoing an early stage of colloid and mucoid degeneration."

By far the greater number of cases of invading carcinoma are met with in females, the bladder becoming implicated from the uterus. Usually the cervix is the part first affected, and the diagnosis is easily made by digital examination of the os uteri. In rare cases, however, the body of the uterus suffers first, and the alarm signal is first sounded by the bladder.

CASE 56. *Hæmaturia of one year's duration. Cystoscopy revealed posterior wall carcinoma.*—Mrs. M. J—, æt. 40, was sent by Dr. Matterson, of Newark, for cystoscopy. Twelve months ago the patient, being in perfect health, suddenly passed a large quantity of blood with her urine. Since then the water has never been free, but the colour and quantity of blood has varied; she has

frequently passed large clots. She has now (April, 1889) pain and frequency; the urine is voided every half hour day and night. The patient has lost flesh lately; the menses stopped a year ago upon the onset of the vesical hæmorrhage, and since then she has occasionally noticed a purulent blood-stained discharge from the vagina. Family history: She has had six children, and three of them have died of phthisis. Her mother, one brother, and one sister died of the same. Her father died of cancer.

Cystoscopy.—The mucous membrane covering the posterior wall in the middle zone was seen to be thickened, slightly upraised, and of a whitish-grey colour. It was crossed by deepish furrows with rounded-off edges. Here and there a black blood-clot filled the gutters. This was especially noticeable at the intersection of the ruts, so that the surface seemed leech-bitten. Ulceration had commenced, for a long necrotic tag like a man-of-war pennant floated away from its attachment at the upper portion of the growth. Every part of the bladder was inflamed. The cavity was contracted, and held four ounces only. Diagnosis: Cancer of the body of the uterus implicating the bladder.

The urethra was dilated, and the bladder examined digitally. The finger impinged upon a thin hard cake let into the posterior wall. With one finger in the vagina and another in the bladder, the two viscera could be felt to be cemented together and to move as one.

CHAPTER VIII.

THE RANK OF THE ELECTRIC CYSTOSCOPE.

CONCLUSIONS.

HAVING placed a sufficient number of illustrative cases before the reader to enable him to judge of the value of the electric cystoscope, it only remains for me to touch upon certain important questions as to the rank which the instrument assumes in the diagnosis, prognosis, prophylaxis, and treatment of obscure reno-vesical diseases.

Diagnosis.

There are few cases more perplexing or more unsatisfactory to treat than those of hæmaturia. Very often the evacuated urine contains no clue as to the source of the blood. The colour of the hæmorrhage is deceptively variable, sometimes being of a renal, sometimes of a vesical type. In only a small proportion of cases does the microscope reveal the cause. Not infrequently

bimanual or rectal examination proves valueless in the localisation of the disease, while the sound, evacuator, and lithotrite often afford only negative results. One illustration will suffice.*

CASE 57. Intermittent, painless, and profuse hæmaturia of ten months' duration. Digital exploration. Death. Carcinoma of the right kidney.—Ten months before death the patient noticed an obstruction in passing water, and voided a blood-clot, which was followed by a profuse hæmaturia of a painless character. After twelve hours the bleeding was arrested. For three months he was free, when another attack supervened of three days' duration. Character: profuse, painless, and vesical. He was again free for ten weeks, when a painless hæmaturia again ensued. Since this time he has had recurrent attacks every ten days.

Status præsens.—No stone, no cause assignable for outbreak. Prostate rather large. Urine of sp. gr. 1015, alkaline. Blood almost pure and of a scarlet colour.

Digital exploration of the bladder was performed by Mr. Coulson, in the hope of finding a villous growth, but the bladder was found to be free. The patient had a severe attack of suppression of urine, from which he recovered, with a profuse attack of herpes labialis. He died a month after the operation. The bladder was somewhat hypertrophied but otherwise healthy. The right kidney was enlarged. Section showed the upper quarter to be renal substance, with innumerable deposits of encephaloid cancer scattered through it, and the lower three quarters to be transformed into a disintegrating blood-red mass of the same character, evidently growth, with a large extravasation of blood. Left kidney was normal, but a branch of the left renal artery contained a hollowed plug (a canalised clot).

The entire aorta was extensively atheromatous. The inferior vena cava was similarly but less diseased. There is no doubt that the renal bleeding had usually been sudden and profuse, and the

* Author, 'Path. Trans.,' p. 166, vol. xxxviii, 1887.

bladder becoming rapidly distended with a weighty alkaline fluid had as rapidly contracted, and had evacuated bright renal blood at once. A renal hæmaturia had thus simulated one of vesical origin.

It is in this very class of symptomless renal hæmaturia that the electric cystoscope is of so much value as a diagnostic agent. A close inspection of the orifices of the ureters under electric light demonstrates at once the renal source of the hæmorrhage if the blood be issuing from the kidney.* Had the case which I have just quoted (Case 57) occurred in cystoscopic times, digital exploration would not have been attempted, for the diagnosis of right renal hæmorrhage could have been easily established.

Typical Renal Cases.†

CASE 58. *Intermittent renal hæmaturia.*—Mr. B—, æt. 30, consulted me in January, 1888, in reference to a hæmaturia. He brought with him a specimen of bloody urine containing much clot. His history was as follows: In January, 1886, he had been out riding for two hours, and came home completely chilled. He passed blood the same evening. He suffered no pain or incon-

* Author, "The Value of Inspecting the Orifices of the Ureters by Electric Light in the Diagnosis of Symptomless Hæmaturia and Pyuria," 'Brit. Med. Journ.,' June 16th, 1888.

† I have met with similar cases under the care of Sir Andrew Clark; Dr. Morris, of Hammersmith; Dr. Marcus Allen, of Brighton, and others, but the details are the same.

venience, except a slight urethral tingling when the clots were passing. The hæmorrhage stopped in the summer, but recurred

FIG. 37.



FIG. 38.



in the winter of 1887, to cease once more upon the advent of the warmer weather.

Present condition.—"A well-built, anæmic man, aged 30. The

urine is voided thrice a day. No pain attends the act. He suffers 'agony' after coition at the neck of the bladder. In mic-turating he has noticed that the urine often becomes more bloody towards the finish."

I expected to find a vesical growth with the electric light, but nothing abnormal could be discovered. The entire bladder was healthy. I was just giving up the examination in despair, when I saw a stream of brightish blood shoot right across the prism. Keeping the instrument fixed, I waited until the medium became clear again, and then I found that I was watching the orifice of the right ureter (Fig. 37). In another second a jet of bloody urine burst from the tiny opening, and after forming many rings, it paled by diffusion and disappeared, only to be replaced by a successor (Fig. 38). The right renal source of the hæmorrhage was at once indicated.

CASE 59. *Renal hæmaturia*.—Mr. C— (under the care of Drs. Underwood and Harvey). A well-built man, æt. 52. Since May, 1887, he had suffered from hæmaturia, which was painless and intermittent in its character, and seemed more dependent upon exercise than anything else. The urine was passed thrice a day. He was disturbed only once at night. Some specimens of hæmaturia contained cylindrical clots. I passed the electric cystoscope under cocaine, and found a low collarette of prostatic growth, but it was obviously not the cause of the hæmorrhage. The bladder was healthy. I could see jets of blood issuing from the right ureter, and the diagnosis of the site of the trouble was at once established.

CASE 60. *Symptomless renal hæmaturia of eighteen months' duration*.—A lady under the care of Dr. Hepworth, of Manchester, and Dr. Battersby, of Cannes. For eighteen months the patient had suffered from hæmaturia. The urine varied much in colour, but there were no symptoms whatever to afford a clue as to the exact source of the bleeding. The electric cystoscope (No. 30, French gauge) showed the bladder to be perfectly healthy, but on turning the instrument towards the left ureteral orifice, a spurt of bloody urine flowed over the prism. I allowed the ureter to

play upon the prism in order to judge of the rhythm of the flow, but it never varied, although Drs. Hewitt, Lys, and I watched it for some little time. It was rather like an artery severed under water.

CASE 61. *Renal hæmaturia of four years' duration*.—Mrs. S—, æt. 45, brought to me by Dr. Grenville Thursfield, by whom the patient was treated ten years ago for gravel and two attacks of hæmoglobinuria. The patient gave the following history: Four years ago hæmaturia commenced, and has remained constant since. The blood is sometimes smoky, but generally bright ("raspberry colour"). She has suffered no pain in micturition, but has experienced a constant desire to pass water. This latter symptom is relieved by the recumbent position and a Barnes' pessary. An iron mixture kept the hæmorrhage in abeyance for some time. The patient passed a renal calculus January 7th, 1888. No symptoms of renal stone.

Cystoscopy.—"Bladder quite free and healthy. Copious swirls of bloody urine can be seen jetting rapidly from the left ureter. Both orifices are prominent." I could detect no renal tumour in any of these cases.

If the hæmorrhage has ceased before the examination is undertaken, and nothing is seen in the bladder to account for the source of the bleeding, it is safer to wait for another attack, so as definitely to localise the lesion to one or other ureter. Sometimes when subacute catarrh of the ureteral canal coexists, the lips of the orifice and the adjoining mucous membrane will have shed their epithelial layer. Upon this bald surface will be deposited from any profuse hæmorrhage of the corresponding kidney a reddish layer of altered

blood. The blush thus caused will be evident long after the bleeding has ceased, and will serve to indicate the side whence it issued.

CASE 62. *Violent renal hæmaturia of traumatic origin abating with rest, relapsing on exertion.*—G. W—, æt. 44 (hospital case). Twelve months previous to coming under observation the patient, being in perfect urinary health, was lifting a moderate sized weight when he felt something snap in his left side. He passed a large quantity of liquid blood; the hæmorrhage was arrested by a week's medicine and bed. It recurred upon his going back to work, and large clots came away with the urine. Since this recurrence the character of the attacks has been the same. The hæmorrhage is always profuse—in some instances alarmingly so—but rest in bed checks it. On resuming his occupation the blood returns with great violence.* No pain, no frequency is complained of. The day I examined him the hæmorrhage had completely ceased.

Cystoscopy.—Bladder healthy throughout. Left ureteral orifice is marked by a red blush, the lips are pouting; right ureteral opening healthy. Prostate small. No renal tumour. Diagnosis: Probably left renal carcinoma. Cystoscopy is contra-indicated in *recent* traumatic renal hæmaturia.†

It comes rather as a surprise to find grave renal hæmorrhage occurring so frequently and without pain,—in fact without any other symptom than the bleeding. Traumatism, carcinoma, and some rare cases of embedded renal stone are acknowledged to give rise to profuse symptom-

* I have seen this patient pass almost pure blood of an arterial colour.

† Compare Dangers of Cystoscopy, p. 208, Case 66.

less hæmaturia, but the surgeon must now realise that other causes than these are responsible for grave and prolonged hæmorrhage from the kidney.

Vesical Hæmaturia.—The cystoscope will be, as I have shown by many typical illustrative cases, an efficient diagnostic agent in the detection of villous papillomata and other vesical growths which cause hæmorrhage, the existence of which one may suspect, but which, without a cutting operation in the shape of a digital exploration, one often cannot absolutely diagnose to be present in the bladder. It will also be of service in the differential diagnosis of the various causes of vesical hæmaturia ; for a careful visual inspection of the surface of the bladder will reveal a hæmorrhagic cystitis, a growth, a calculus, an enlarged prostate, or an ulceration, as the source of the hæmorrhage.

Pyuria.

Renal Pyuria.—A stream of pus issuing from the ureteral orifice is not quite so readily or so certainly detected as a jet of blood, but it can be diagnosed with care. The glycerine-like stream of health is replaced by a muddy current of a colour which varies from a light straw to a darker yellow.

CASE 63. *Pyuria for two years, due to cysto-pyelitis.*—Mrs. X—, under the care of Dr. Moore, of Maidenhead, who asked me to examine the bladder with electric light in order to ascertain if the pus, which was abundant in the urine, came from the kidney or bladder. The history of the patient is as follows: Twenty years ago she had strumous caries of one of the right lower ribs. A deep scar now marks the sinus which then existed. It is not far from the right renal region. In January, 1887, a sudden attack of pain in the right hypochondriac region was complained of, and the symptoms which followed resembled biliary colic. The pain continued off and on, descending at each attack somewhat lower in the abdomen, until it became very similar to renal colic. Eventually extreme pain was experienced in the bladder and frequency of micturition with evidences of acute cystitis supervened. Various special opinions had been taken, both as regards the uterus and the kidney.

Cystoscopy under anæsthesia.—"The bladder is covered with small hæmorrhagic petechiæ, which are more numerous towards the orifice of the right ureter. A dull flapping stream of dark murky fluid issues sluggishly, but at regular intervals, from the right ureter. The left ureteral orifice is small, and is ejecting healthy urine. On rewashing and re-examining the bladder the small punctiform hæmorrhages were seen to be increased in size transversely. It is uncertain whether this increase is due to the frequent washing or to the extension of the inflamed mucous membrane, probably the latter." Diagnosis: Right pyelitis invading bladder.*

Chyluria.

CASE 64. *Chyluria.*—By the courtesy of Mr. Clement Lucas I was allowed to examine a case of chyluria in a woman aged 24.† A small swelling had been noticed at birth in the lumbar region,

* Compare Case 3, p. 99.

† Case was shown at the Clinical Society, April 26th. The 'Lancet,' p. 886, May 4th, 1889.

but this had since increased in size to that of a child's head. When she was seven years old the urine became thick and milky.

Associated with the tumour was an extensive nævus invading the posterior aspect of the thigh. The swelling had a distinct limit, and appeared to be also nævoid in character. There was probably some communication between the swelling and the lymphatics around the kidney.*

Cystoscopy.—Bladder healthy, but surface blurred with milky deposit. Jets of milky fluid were distinctly seen to issue from the right ureter, and to mix rapidly with the surrounding medium.

The electric cystoscope, therefore, obviously tends to replace the large collection of instruments or procedures which attempt the differential diagnosis of the source of hæmaturia and pyuria.† It cannot altogether displace such instruments as Tuchmann's‡ which aim at obtaining urine direct from either male kidney, for before an attempt is made to excise a kidney, the existence and working capacity of its fellow gland must be ascertained.§ Upon the capacity of the latter to bear the double burden depends the advisability of the proposed nephrectomy. Now, the stress

* Compare author's dissection of Dr. Stephen Mackenzie's case, 'Path. Trans.,' vol. xxxiii, pl. xxii, p. 394, 1882.

† Cf. author, "Suction of the Male Ureters," 'Lancet,' Sept. 18th, 1886, p. 529.

‡ Tuchmann, 'Die Diagnose der Blasen und Nieren Krankheiten,' Berlin, 1887. .

§ Cf. R. W. Weir, "Extirpation of Kidney," 'Annals of Surgery,' 1885, p. 317, vol. i.

resistance of a kidney can only be accurately grasped by a rigid examination of its urine; and further, that secretion must be obtained directly from the fountain head—it must not be contaminated by the admixture of urine flowing from its diseased companion. The material for such an examination can only be obtained by means of Tuchmann's ureteral forceps or the author's ureter aspirator.

The plan of introducing a catheter into the male ureteral orifice under electric light is not yet within the range of practical surgery (compare p. 60), but I believe it soon will be.

Foreign Bodies.—It sometimes happens that a case of obscure vesical disease is met with, and a foreign body is suspected as being the cause of the anomalous symptoms, although no direct evidence can be obtained from the patient as to the introduction of the same into the bladder. Calcareous deposit may rapidly form upon it, and being detected by the sound, may tempt removal by the lithotrite. The calculous deposit may be removed, but the nucleus left behind to induce a fresh accumulation. As a good example of the value of the cystoscope in this class the following may be given.

CASE 65.—*Vesical stone forming around a split umbrella ring.**—A deaf mute, æt. 22, with infantile paralysis of the right side, was brought by his father for relief of symptoms of stone which had been noticed three months. The boy had been in the habit of masturbating.

A stone was detected and crushed by Mr. Heycock, under whose care the case came, and to whom I am indebted for permission to publish these details. It was noticed, however, that the fragments evacuated did not correspond to the size of the stone, which had been gauged by the lithotrite at the commencement of the operation, and the most careful sounding did not reveal where the deficit lay. The boy developed symptoms of peritonitis and died.

On post-mortem, slate-coloured pus was found in the sheath of the right rectus, and which proved to be an extension upwards of severe extra-peritoneal cellulitis. I found this had started and had spread from the posterior surface of the bladder. The loops of small intestine, which occupied the rectovesical pouch, were glued together and to the back of the bladder by soft lymph. The bladder and prostate were, therefore, removed *en masse*, and the former was opened in front. The vesical wall was thick, the cavity contracted, being only as large as a duck's egg. A split india-rubber umbrella ring was found behind the trigone; one side of its circumference rested on the interureteral bar, and the other dipped into an ulcer of the posterior wall. On removing the ring and examining the ulcer more carefully, it was seen to have perforated all the coats of the bladder, with the exception of the peritoneal, and it was evident that the urine had percolated through this opening, and had set up, primarily, cellulitis, and secondarily peritonitis. There is no doubt that this ulcer was caused by the foreign body, and must have finally given way under the distending force of the water used in the evacuation of the fragments, for the traces of the rush of water were visible under the peritoneal covering up to the top of the bladder in the form of a track of fine, calculous débris.

The mucous membrane of the bladder was inflamed, the ureters

* Author, 'Path. Trans.,' 1887, vol. xxxviii, p. 193.

healthy, and the condition of the other viscera apparently normal. It is presumable that the split umbrella ring had been pressed down the canal to produce erotic sensations.

This case has an important clinical aspect. It will be at once conceded that the operator may be justly exonerated for having left so soft, so elastic, so resilient a body as india rubber in the bladder after litholapaxy. Doubtless, when his instrument engaged the ring he would suppose that a fold of an atonic bladder had been grasped and would wisely desist from crushing the same, while it is obvious that so sound-deadening a material would give no just or reliable evidence of its presence when struck with the beak of a solid steel sound, though it could have been at once detected by the electric cystoscope.

Stones.—The cystoscope cannot displace the manageable sound in the diagnosis of stone in the bladder, but there are some cases overlooked by the practitioner, which have but few characteristic symptoms, and which are classed as “latent” calculi.* In this class the cystoscope may glean what the sound has left behind, or may discover stones for which the sound has not been used. Electric illumination will be of use in small saccu-

* Author, “Latent Vesical Calculus,” ‘Trans. of the West Lond. Medico-Chir. Society,’ vol. ii, p. 45.

lated stone (*vide* p. 146) and post-prostatic, or post-trigonal pouch stones. It has been said that the electric light will be useful in ascertaining the *entire* removal of fragments after litholapaxy. This is hardly likely. The useful hint given by Freyer* of using the aspirator and cannula in the examination of small calculi, will usually demonstrate the completion of the operation.

Summing up briefly the question of the diagnostic rank which the cystoscope assumes, it may be fairly said that it ought to be reserved for those cases of obscure vesical disease which other methods of examination have failed to elucidate. It will never become so popular or so generally employed as its kindred, the ophthalmoscope, laryngoscope, and otoscope, for the necessary adjunct of the battery and the natural objection of the patient to instrumentation will considerably curtail its use. It has become a most important atom in the molecule of the diagnosis of obscure vesical disease, for it procures for us *a visual examination of the bladder without a cutting operation*. It will therefore rank immediately before, and in most cases supersede, the operation of boutonnière

* "Stone Operations," 'Brit. Med. Journ,' p. 1373, Dec. 24th, 1887.

or Sir H. Thompson's digital exploration of the bladder.

Electric Cystoscopy v. Digital Exploration for Diagnostic Purposes.—I would submit that digital exploration for diagnosis in the greater number of obscure cases is quite needless, and that the electric light is, when used with judgment and experience, quite equal to the finger. To support these statements I give a list of the *first* forty-three cases in which I used the light for diagnostic purposes. These forty-three cases will serve to compare with the list of forty-three published by Sir Henry Thompson.* I have, of course, omitted from this list calculi, vesical growths, and other morbid conditions which have lately come under my care, and which have been easily diagnosed *without the light*. I have, moreover, excluded a very large number of cases of well-recognised bladder disease in which I have employed the light *educationally* in order to control my clinical observations and speculations by direct visual research.

The numbering does not correspond to the cases quoted in the text, for they have not all been quoted.

* Sir Henry Thompson, 'Tumours of the Bladder,' p. 29.

No.	Initials.	Sex.	Age.	Under the care of.	Present at the cystoscopy.	Prominent symptom.	Disease found.
1	B. E.	M.	34	Self	Self. Examined five times	Hæmaturia...	Hæmorrhagic cystitis.
2	Mr. B.	M.	30	Self	Self. Examined twice	Hæmaturia...	Renal source.
3	N. C.	M.	70	Mr. Eve	Mr. Eve and others...	Hæmaturia...	Epithelioma of base (right side) drained.
4	M. B.	F.	55	Mr. Heycock	Mr. Heycock and others	Hæmaturia...	Encephaloid cancer of left base removed, and recurred.
5	Mr. C.	M.	52	Drs. Harvey and Underwood	Dr. Underwood	Hæmaturia...	Of renal origin.
6	Mr. H.	M.	31	Mr. Molson	Self	Frequency and pain	Large calculus (latent).
7	R. S.	F.	27	Mr. Jessett	Mr. Jessett and others	Pain...	Chronic cystitis.
8	W. G.	M.	26	Mr. McCarthy	Mr. McCarthy and others	Hæmaturia...	Tubercular disease of base.
9	—	M.	20	Dr. Carvell and Mr. Reeves	Several	Hæmaturia...	Tubercular cystitis.
10	I. L.	M.	62	Mr. Heycock	Mr. Heycock and others	Hæmaturia...	Villous epithelioma (extensive). Operation not advised.
11	L. N.	M.	24	Mr. Coulson	Mr. Coulson and others	Hæmaturia...	Tuberculous cystitis.
12	G. M.	M.	63	Mr. Edwards	Mr. Edwards and others	Hæmaturia...	Villous (?) carcinoma. Operation not advised.
13	Mr. J. H.	M.	60	Dr. Benham	Dr. Benham	Hæmaturia (profuse)	Calculus.
14	Mr. P.	M.	45	Drs. De Gruyther and Carnalt Jones	Several	Hæmaturia...	Carcinoma of posterior wall. Operation contra-indicated.
15	Mr. H.	M.	65	Dr. F. M. Corner	Several	Frequency and pain	Chronic cystitis.
16	Mr. C.	M.	55	Dr. Simon	Several	Frequency and pain	Swelling of neck. Died of tuberculosis.
17	Mr. M.	M.	26	Sir A. Clark	Several	Frequency and pain	Tuberculosis.
18	Mrs. H.	F.	40	Drs. Davson and Waterhouse	Dr. Davson and Dr. Waterhouse	Hæmaturia...	Right renal hæmaturia and localised right-sided hæmorrhagic cystitis.
19	R.	M.	40	Dr. Fly Smith	Dr. Fly Smith	Frequency	Alveolar carcinoma of posterior wall. Operation. Recurred.
20	—	M.	43	Dr. Harle, of Hackney	Dr. Harle	Hæmaturia...	Villous papilloma with an epitheliomatous base.

21	Mrs. N.	F.	40	Dr. Moore, of Maidenhead	Dr. Moore	Pyuria	Of right renal origin. Recurred.
22	E. L.	F.	37	Hospital	Self	Frequency and pain	Chronic cystitis.
23	Mrs. T.	F.	46	Dr. Cursham Corner	Several	Frequency and grit	Chronic cystitis.
24	Miss B.	F.	27	Dr. Hepworth, of Manchester, and Dr. Bat- tersby, of Cannes	Drs. Hewitt and Lys	Hæmaturia...	Left renal origin.
25	R. D.	M.	26	Dr. S. Miller, of Windsor	Several	Hæmaturia...	Growth removed. An important case.
26	Mr. W.	M.	37	Dr. Cole, of Bath, and Dr. Grose, of Melk-sham	Several	Hæmaturia and frequency	Tubercular exfoliating cystitis.
27	Mr. O.	M.	56	Dr. Travers Stubbs	Several	Hæmaturia six weeks	Epithelioma—removed by suction, recurred.
28	Mr. D.	M.	57	Dr. Stewart, of Newport-on-Tay, and Dr. White	Dr. White	Frequency and pain	Chronic cystitis; of prostatic origin.
29	Mr. W.	M.	39	Dr. Sparrow, of South-sea	Mr. George Pollock	Frequency	Epithelioma of posterior wall; drained
30	Mr. L. J.	M.	62	Dr. Simms	Dr. Simms	Hæmaturia...	Epithelioma on posterior wall.
31	Miss W.	F.	41	Sir A. Clark	Sir A. Clark and Dr. Matthews Duncan	Hæmaturia...	Of renal origin (cardiac).
32	Mrs. B.	F.	43	Dr. Oldfield	Dr. Oldfield	Hæmaturia...	Villous papilloma of posterior wall over left ureter.
33	Mr. F. O.	M.	47	Dr. F. M. Corner	Dr. F. M. Corner	Hæmaturia...	Tuberculosis.
34	T.	M.	39	Dr. Caesar	Several	Hæmaturia and frequency	Tuberculous.
35	Mr. C. B.	M.	32	Dr. Bull, of Chislehurst	Self. Examined twice	Frequency and pain	Chronic cystitis.
36	Mr. J. H.	M.	53	Homeopath	Dr. Goodman	Hæmaturia...	Flat epithelioma posterior wall.
37	I. C.	M.	60	Out-patient	Self	Hæmaturia...	Epithelioma over right ureter.
38	Mr. W.	M.	22	Dr. Debenham and Dr. Goldie	Several	Frequency and pain	Tuberculous.
39	Mr. H.	M.	44	Self	Several	Profuse hæmaturia two weeks	Hæmorrhagic cystitis.
40	Mr. S.	M.	75	Mr. B. W. Walker	Mr. Walker	Frequency	Chronic cystitis.
41	J. A.	M.	75	Self	Dr. Semple and Dr. Kitching, of Cleve-land	Pain, frequency, and hæmaturia	Epithelioma over right ureter.
42	W. R.	M.	20	Self	Self	Hæmaturia; painless	Ulceration; probably tuberculous.
43	E. P.	M.	20	Self	Self	Great frequency; muco-pus in urine	Cystitis.

* Sir H. Thompson, 'Tumours of the Bladder,' p. 29, 1884.

The comparison of the two methods and lists permits of the following statements being made :

1. Digital exploration is a cutting operation, needing confinement to bed. Electric cystoscopy does not need such confinement, although it is wiser and safer to have the patient in bed for the rest of the day. I have used the cystoscope routinely in out-patient and private practice, favorable cases being examined without any preparation. Certain cases, however, as will be seen in the third statement, are not examined except when in bed.

2. The former operation needs an anæsthetic. In the latter it is not absolutely necessary. In the greater number of cases I have neither used gaseous narcosis nor cocaine. I employ anæsthesia (*a*) in females for delicacy, (*b*) in tuberculosis or similar cases where the prostatic urethra is extremely sensitive, (*c*) in order to make a leisurely prognosis of a discovered growth so as to determine the expediency of operating.

3. Digital exploration is not absolutely free from risk or hæmorrhage, and frequently either a troublesome fistula or a hyper-sensitive scar is left in the urethra. Cystoscopy is in most cases, if it be gentle and purposive, as free from risk as

routine catheterism or sounding. There is, as every surgeon is aware, some risk in the first introduction of any instrument through the deep urethra,—a risk which must not be made light of. There is also some danger to be incurred in washing out the bladder for the first few times if residual urine be present, and, lastly, there are certain diseases, such as tuberculosis of the urinary tract, which resent at once any instrumental interference.

The surgeon must therefore select cases *for routine observation* with care and judgment—those which his knowledge of the idiosyncrasies of urinary disease can assure him will be suitable. He must regard the cystoscope in the same light and with the same deference that he should regard the bougie, the sound, or the catheter, for, as Sir Henry Thompson has so tersely and so wisely expressed it,* “The introduction of an instrument is, more or less, an evil, never to be resorted to, unless a greater evil be present, which its employment may probably remedy.”

I myself avoid using the cystoscope if the following conditions are present :

* Sir Henry Thompson, ‘Diseases of the Urinary Organs,’ 8th ed., p. 53, 1888.

1. Obvious tuberculosis of the urinary tract.
2. *Traumatic* renal hæmaturia of recent origin.
3. Irregularly enlarged prostates.
4. Residual urine due to ataxia.
5. Phosphaturia.

I include traumatic renal hæmaturia on the strength of a fatal case which occurred quite recently in my own practice.

CASE 66. *Traumatic renal hæmaturia. Cystoscopy. Acute suppurative nephritis. Death.*—A gentleman, æt. 50, was lately recommended to me for cystoscopy in order to ascertain the cause of a severe intermittent hæmaturia of eight weeks' duration. The patient stated that one evening after a heavy meal he was stooping down, attempting to drag out a heavy lower drawer from his bureau, when he suddenly felt an intense desire to urinate, and he immediately passed a large quantity of bright fluid blood. He is not quite certain as to whether he felt something give way in his left side or not. The hæmorrhage ceased and recurred, finally becoming intermittent. The blood was always intimately mixed.

On examination with the cystoscope "the bladder appears quite healthy. The mucous membrane is smooth. On the right side of the base is a small blood-clot adherent to the surface. The probability is that the case is renal, but as no blood is at present flowing, it is uncertain which side." The patient had a rigor the same evening and fever, he began to suffer great pain to the right of the navel and in the left renal region. The blood ceased, the temperature fluctuated, he became uræmic, and died, evidently of suppurative nephritis, within three weeks. No autopsy was allowed.

I am not able to state accurately the lethal part played by the examination in this fatal case, for

no autopsy was allowed. It appeared to me that the suppurative nephritis followed as a direct consequence upon the cystoscopy. I can safely say that it was not the result of any operative lesion, for the instrument was swallowed easily by the urethra, the visual examination was finished in less than a minute, and no pain was caused. The first signal of alarm was the rigor twelve hours after. From what I saw of the patient subsequently, I believe that the damaged kidney had suppurated under the septic influence of urethral fever.

4. In most cases the educated eye is to be preferred to, and relied upon rather than, the finger. I am well aware that Sir Henry Thompson trusts more to his great tactile delicacy ; but, on placing the diagnoses of these two lists side by side, we shall see that the comparison is in favour of sight.

<i>Sir Henry Thompson's List.</i>		<i>Author's List.</i>	
	Cases.		Cases.
Nothing found	14	Nothing abnormal seen	
Calculi	2	(Cases 16 and 29*)	2
A scale of calcareous material.....	4	Calculi	2
Tumours	20	Renal hæmaturia	6
Prostatic	2	Tubercular cystitis.....	9
Subvilloid condition	1	Hæmorrhagic cystitis	2
		Tumours	15
		Chronic cystitis	7
	43		43

* Case 38 in the text, p. 154.

5. It must be readily admitted that digital exploration allows of the bladder being subsequently drained ; but the rest thus afforded is not always necessary, nor is it always productive of benefit ; for example, Cases 3, 15, 22, 24, 30, 31, 34 in Sir Henry Thompson's list were not improved by drainage.

Prophylaxis.—A belief has been expressed that the early use of the cystoscope in hæmaturia will tend to limit the size and number of vesical papillomata by enabling us to detect and remove these and other growths in their very infancy.

I do not quite agree with this belief, for a careful examination of the histories and pathological specimens of vesical growths has convinced me that vesical tumours do not obey a fixed law of development, for they do not increase in size *pari passu* with the duration of symptoms.* The increase depends upon the character of the growth, its position in the bladder, and its method of attachment to the wall. It is therefore possible for a growth to attain a considerable size before

* Small *apple*-sized growths were found, 5 weeks, 6 months, 2 years, 5 years, 14 years, after the onset of symptoms, whilst *nut*-sized tumours were discovered 5 months, 9 months, 18 months, 2½ years, 4 years, 7 years, and 28 years after the first outbreak of the hæmaturia.

any evidence is afforded of its presence. It thus lies "latent" until a chance congestion or accident develops the characteristic hæmaturia.*

CASE 67. *Hæmaturia of two months' duration. Cystoscopy revealed a large walnut-sized carcinoma of posterior wall.*—Mr. G. T—, æt. 60, under the care of Mr. Passmore, of Luton, was kindly referred to me by him for cystoscopy and treatment. Two months ago the patient was in perfect urinary health, when he suddenly passed blood in his urine, but it was easily checked, and he has only had three attacks since, each of which were of short duration. When he is passing blood he has noticed that the urine is usually clearer in the morning when he gets up, getting gradually bloodier towards the evening. The blood is usually intimately mixed. He has no pain, no difficulty, and no frequency of micturition. Prostate of fair size.

Cystoscopy.—(No anæsthetic). "Bladder base and walls blurred. On the posterior wall, unusually higher up, and towards the left side is a stalked? alveolar carcinoma the size of a large walnut. Its surface is furry in some parts and in others large villoid-like pieces of the growth are exfoliating, and are floating from the under surface, evidently in a necrotic state, for they are of a dirty French grey colour.

Prognosis.

Vesical Growth.—With a greater visual experience of vesical growths there is very little doubt but that the cystoscope will become an important

* Thus a case under A. R. Jackson ('Boston Med.-Chirurg.,' April 2nd, 1870, p. 120) presented symptoms for only five weeks, and yet a mass weighing 8½ oz. was removed—fibro-papilloma. Compare remarks on p. 153.

factor in the prognosis of the duration of life in this disease. Our prognostic power depends upon our diagnosis of the *character* of the growth, and this again upon our cystoscopic experience and the knowledge we can acquire from museum specimens, for although the tumour alters greatly after death, and more so after a long retention in spirits, yet there are certain points in these bladders which immediately strike us as having malignant characters.

As examples I would mention the very suspicious combination of pure villous papillomata with a lumpy or nodular growth, especially if these two forms of neoplasm are upon apposed surfaces of the bladder. Such a condition is nearly always malignant, occurring chiefly in carcinoma,* but sometimes in sarcoma. In 10 per cent. of the carcinomata of the bladder *pure* villous papillomata co-exist. They are perhaps produced by the irritation of the *contact* of the carcinomatous growth. Again, if two or more distinct nodules, or isolated projecting growths, are found in the same bladder, as in Case 48, p. 173, especially if they be on apposed surfaces, the disease is undoubtedly ma-

* Author, Jacksonian Prize Essay, "Tumours of the Bladder."

lignant, and is probably carcinoma reduplicated or multiplied by contact.*

I believe the following surface appearances may be accepted as very suspicious of malignancy :

1. Surface shreddy and disintegrating.
2. Villi, if present, showing a great tendency to necrose and drop off.
3. Deposition of calcareous matter, formation of phosphatic concretions (Fig. 33, Case 48).
4. Sessility.
5. Grooving, indentation or other sign of friability of tissue (Fig. 32, Case 44).
6. Cystitis of a low grade appearing early in the case (of irritative origin).

Duration of Life.

Without speaking very definitely or statistically upon this point, for I hope to do so shortly in a different work, I would submit that if the tumour be of an obvious papillomatous nature, the duration of life may be reckoned by *years*. The actual method in which the growth will prove fatal if left untouched will depend upon the

* Author, 'Pathological Transactions,' 1888 ; 'Lancet,' March 10th, 1888.

softness of its structure and its position in the bladder.

As regards malignant tumours, those throttling either ureteral orifice or obstructing the urethral opening complete their course very rapidly (compare p. 183). Those tumours situated on the posterior wall if left alone are slow in this growth, and usually cause little inconvenience for months after their birth except through the loss of blood.

Treatment.

Cystitis.—I wish to submit, but with diffidence, that a cystoscopic examination of cystitis indicates the character of injection, whether it be of a caustic, emollient, or astringent nature which should be used to allay and cure the inflammatory vesical condition in the same way that an inspection of a sore-throat guides us as to the sort of gargle to be employed.

Foreign Bodies.—Not only does the cystoscope enable us to discover foreign bodies (other than stones) but will by revealing their shape and nature decide us as to the operation which is most suitable for their removal. If the body be long and

able to be extracted by the lithotrite (compare pp. 140 and 200), the beak can be guided to that part of the bladder which contains the end or portion best suited for seizure by the blades and the body removed through the urethra. If the object has become bulky by calculous deposition the cystoscope will then enable the operator to decide upon a cutting operation.

A case which came under my notice in Brussels affords a good example.

CASE 68.—A boy, æt. 18, had thrust by some means or other a full ear of corn down his urethra, most probably for erotic purposes. The stalk broke off and the ear made its way into the bladder, where a large calculus was speedily constructed upon it as a nucleus. Litholapaxy was performed, and though the superficies was partially removed, yet the main body, of course, could not be extracted, for every part was densely permeated with cretaceous material. The operator, uncertain, I believe, of the true nature of the substance he was dealing with, finally performed supra-pubic lithotomy, and removed an oval, irregular mass, which on section displayed an ear of corn as its nucleus.* In this case the cystoscope would have at once revealed the nature and size of the object, which could have been extracted by lateral lithotomy.

Tuberculosis.—The cystoscope definitely localises a tubercular lesion, and indicates the utility or

* Similar cases are to be found in Harrison, 'Clinical Lectures;' Heath, of Manchester, 'Manchester Medical and Surgical Reports,' vol. ii; Thompson, 'Brit. Med. Journal,' April 14th, 1888, p. 776.

inutility of a supra-pubic cystotomy in order to scrape out the deposits.*

If the ulceration be upon the base and secondary to a prostatic lesion such a procedure is worse than useless; if, however, the deposits of tubercle are placed upon the posterior wall, the attempt is surgical even if it be not ultimately successful.

Vesical Tumours.—Upon the cystoscopic appearances of the growth will depend the method of operation, whether the route chosen be through the perinæum or above the pubes. Those tumours which are shown to be small, lightly pedicled, and near the urethral orifice, may easily be treated by the boutonnière, whilst those which are multiple, bulky, or sessile need the wider access which is afforded by a *sectio alta*. I would again point to those cases in which the growth was removed in the eye of a catheter and the patient was at once freed from the cause of his trouble,† and to express a hope that in a limited class we may be able, after having localised a small growth by means of a cystoscope, to remove the same with

* Compare Guyon ('Leçons Clin.,' 1888, p. 690) and Reverdin, of Geneva, 'Ann. Mat. Gén. Univ.,' Jan., 1888.

† Bryant, 'Surgery,' p. 67, female child; Ultzmann, Wiener Klinik, "Hematurie," male, æt. 60; Maas, 'Berlin. klin. Woch.,' 1876, p. 46, three cases, all males, aged respectively 53, 33, 38.

properly constructed lithotrite or evacuating catheters, as I was lucky enough to accomplish in Case 40, p. 157.

I have already pointed out that the enlarged 40 French gauge cystoscope will be of use in the boutonnière operation in controlling the operator's fingers and forceps, step by step, so that no growth is left behind. One of the causes for recurrence (apart from malignant disease) is the *incompleteness* of the eradication of the tumour.*

In most of the cases I have detailed, the operation contemplated was at once *vetoed*, the cystoscopic appearances demonstrating the malignant nature of the growth.

Instead, therefore, of blindly operating upon all vesical neoplasms,† and obtaining by such routine practice a needless curtailment of life, we shall be in a better position, after cystoscopic examination, to select those cases suitable for operative interference, and leave those untouched which it is the wisest policy to leave alone.

Supra-pubic Prostatectomy.—The cystoscope will

* Author, Jacksonian Prize Essay, "Tumours of the Bladder."

† No operator would of course attempt to remove those growths which have plainly infiltrated the bladder base or wall. Such cases do not need the employment of the electric cystoscope.

also be a useful guide in the indication of the necessity for MacGill's operation,*—the suprapubic removal of the prostatic “median lobe.”

* MacGill, “Hypertrophy of the Prostate and its Relief by Operation,” ‘Lancet,’ Feb. 4th, 1888, p. 215.

PART II.

THE ELECTRIC ILLUMINATION OF
THE URETHRA.

CHAPTER IX.

ELECTRIC ILLUMINATION OF THE URETHRA.

THE ELECTRIC URETHROSCOPE.

a. The platinum loop (the Nitze-Leiter) 1879.

b. The incandescent lamp (Schall, Leiter) 1886,
1887.

The Nitze-Leiter urethroscope is constructed upon the same principle as the Nitze-Leiter cystoscope. Its source of illumination is a platinum wire, and the light is not cast from without as is the fashion of most urethroscopes, but being fixed in the distal end of the cannula is introduced into the urethra to illuminate a given area of the surface of that canal. This instrument is hampered by the same water-cooling apparatus, is encumbered by the same large and evil-smelling Bunsen battery, and is therefore almost as costly and as complicated as the Nitze-Leiter cystoscope.

The original Nitze urethroscope needed but little

improvement at Leiter's hands. Some changes were made, however, the most important of which was for effectually shielding the eye from the blinding rays of light which were cast towards the ocular end of the tube in Nitze's original instrument.

The Nitze-Leiter urethroscope will be best understood by a reference to Fig. 39. The instrument has had the cannula, which is represented by the dotted line, removed. The straight portion *b b*, contains the illuminating and cooling apparatus. At the distal end of this shaft is the platinum loop *c*, shown on a larger scale in Fig. 40. This platinum loop is easily fitted into the sockets *a b*, Fig. 40, and therefore readily renewable. The metal body of the shaft (*b b*, Fig. 39) serves as one of the connections between the battery and the loop, the other conductor being an insulated wire packed in with the water tube (Fig. 41, *h, g, i*,). The minute anatomy of the shaft (*b, b*, Fig. 39) is represented in Fig. 41. The water canals and the currents traversing them, are indicated by arrows *d, a, b, e*, the reservoir connections fit on to these water tubes *d* and *e*, by what workmen call "Dutch screws" (Fig. 39, *h, i*).

The insulated wire is represented in Fig. 41, *h*.

This shaft (Fig. 39, *b, b*,) was thrust into various-sized and lengthened cannulæ. Those for the prostatic urethra have an elbow with a window on the convexity of the bend, this window being hermetically sealed with a small glass plate.

The Nitze-Leiter urethroscope was a very great advance upon its predecessors. Thorough illumination of the entire urethra could be obtained by it, a surface of the urethra 1 cm. square being lighted up at a time. It could be used without any discomfort to the patient, for the great heat of the platinum loop lamp was immediately absorbed by the cooling currents of water.

The instrument never became popular. It remained in the hands of certain continental specialists, who persevered with it, cumbersome as it was, and who did good and sound work by its means. Schall's instrument, in which the light is cast from without, rapidly superseded it; but only to be replaced in its turn by Leiter's pattern.

(*b*) *The Incandescent-Lamp Urethroscope.*

Directly the Edison or Swan lamp in its smallest form was introduced it was employed for the illu-

FIG. 39.

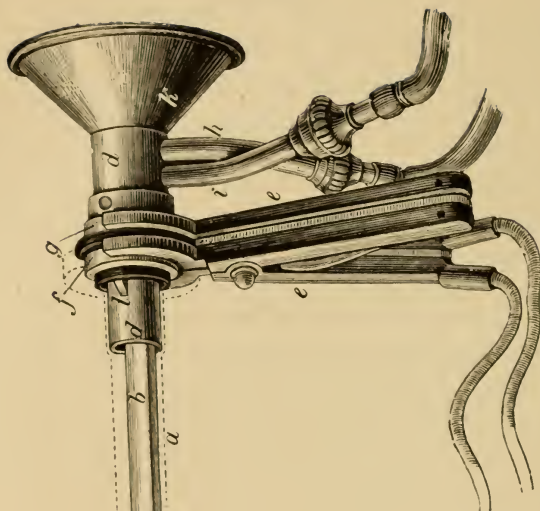
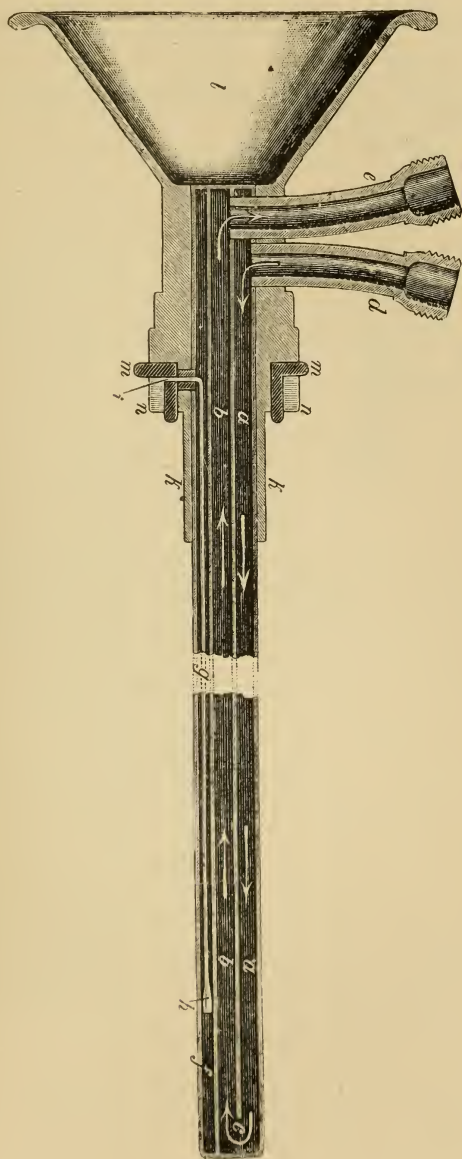


FIG. 40.



FIG. 41.



mination of a variety of endoscopic instruments, such as those for the vagina, nose, throat, ear, and rectum. Mr. Schall, of the firm of Reiniger, Gebbert, and Schall of Erlangen, constructed an incandescent-lamp urethroscope which somewhat resembled the old-fashioned Desormeaux-Cruise instrument, the hot and unwieldy paraffin lamp of the latter being replaced by a small incandescent lamp.

The Schall Urethroscope.

This instrument is made up of three pieces, the cannula, the lantern-box, and the handle (Fig. 42).

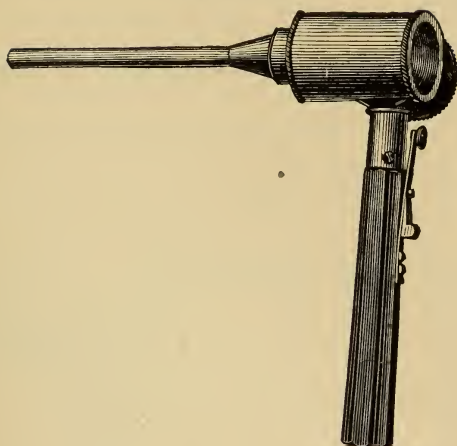
The handle carries an incandescent lamp upon its summit, and fits into the lantern-box.

The lantern-box is a closed cylinder which is furnished with an obliquely placed flat or concave mirror for reflecting the rays of light along the cannula.

This instrument is a powerful one, but it has been entirely superseded by a simpler and more perfect innovation,—Leiter's new incandescent-lamp urethroscope.*

* J. Leiter, 'Neue Beleuchtungs Apparate,' Wien, 1887 (Notiz zur Priorität).

FIG. 42.

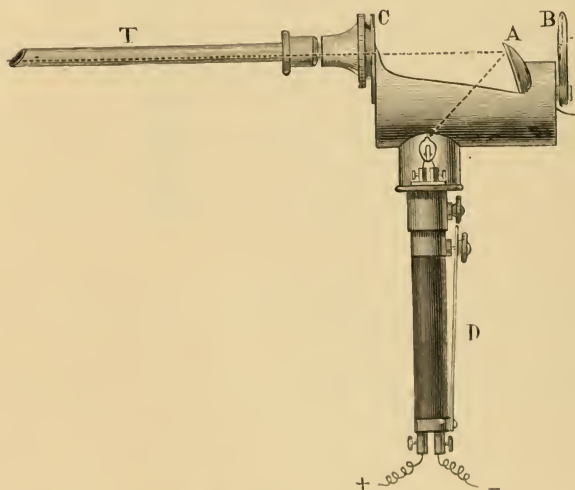


The Leiter Incandescent-Lamp Urethroscop.

Construction.—The incandescent-lamp urethroscop is made up of three pieces, D, B C, and T (Fig. 43). These pieces may be described as follows: 1. The handle D is made of caoutchouc, and carries on its upper end a small incandescent lamp, which is connected with the two binding screws which project from its lower end. A light steel spring forms the key. The handle fits into the bottom of the lantern B C. 2. The lantern B C is a roofless gutter-shaped box, carrying at one end a fixed, obliquely-placed concave mirror A for reflecting light along the urethral

cannula T, and at the other the nozzle C for fitting on the urethral tubes. Two additional and important items of the lantern consist in small perforations around the lamp for ventilating off the

FIG. 43.



Leiter's Electric Endoscope for Urethral Examination.

heat, and a small movable lens B for myopic or hypermetropic observers. 3. A series of urethral cannulæ T of various sizes and lengths. (Those supplied at present by Leiter are not long enough.)

Fig. 43 shows that the light from the lamp is cast directly along the tube, and that the observer's

eye, which is placed at B, is shielded from the blinding light emitted by the lamp. It is worked by the same battery as the cystoscope.

The instrument is especially well made, is handy, and bears a good deal of rough usage. It is difficult to understand how it can get out of order. One or two points are, however, of some practical importance. The little incandescent lamp may, after a month or two of good usage, become blackened or fused, and require changing. To effect this all that is necessary is to withdraw the handle D from the lantern B C by relaxing the grip-screw. The two small binding-screws which are shown at the base of the "Mignon" lamp are then relaxed, the lamp lifted out, and a fresh one fixed in, care being taken that the binding screws are sent sufficiently home to make firm contact with the terminals of the lamp. The handle is now refitted into the bottom of the lantern, and fixed there with a turn of the grip-screw. In performing this little manœuvre the light must be placed at the proper level to allow of the full reflection of its rays along the cannula from the mirror. If the lamp be thrust too far or not far enough into the lantern, the observer will be annoyed to find in his next urethral examination

that an insufficient illumination is afforded by the lamp.

To prevent this subsequent unnecessary delay and vexation, let it be made a rule on changing a lamp to obtain its proper position in the lantern at the same time. Insert the handle into the lantern; put the lamp in action, and project the light emitted from the end of the affixed cannula upon a dark surface. By elevating or depressing the handle, and watching the varying illumination of the circle of light cast upon the screen, that position of the lamp which will afford the greatest brilliancy can be readily ascertained, and a turn of the grip-screw will thus secure it.

CHAPTER X.

THE USE AND CAPABILITIES OF THE INCANDESCENT-
LAMP URETHROSCOPE.

No difficulty can be encountered in the use of the urethroscope, and but few precautions are necessary to secure a brilliantly illuminated urethral surface. The only obstacle to a successful examination is the oozing of blood, if the examination has been rough ; or the presence of pus or lubricant, even a small quantity of which will effectually obscure the vision.

Select a cannula of medium length* and of a gauge which the meatus will admit. It will be found that the larger the tubes are, so much more searching and accurate will the examination prove. I do not hesitate to slit the meatus

* By compressing the penis in its long axis the operator can often make a very short cannula suffice for the purpose of urethroscopy. It is a useful knack to acquire, for obviously the light diminishes in direct proportion to the increased length of the cannula.

downwards prior to the urethroscopy if it be at all narrow, for not only is a gleet or an urethral pain, or even a functionally irritable bladder, often cured by this slight operation, but a due expansion of the urethral folds by the larger calibred cannula is obtained. It is not improbable that small patches of disease lurking in the folds of an insufficiently distended urethra may be overlooked if the small-gauged cannula be employed.

I make it a rule to examine under the influence of cocaine.* It might be thought that the cocaine is likely to doubly deceive the observer. First, that its supposed constrictive action on the small

* Much has been written and said about the danger of this drug, and there is some confusion as to when untoward effects are to be expected from its use. I have seen faintings after applications to the larynx and pharynx, which is conceivable in a position so highly endowed with reflexes. But I have never noticed any bad result from vesico-urethral injections except in one patient, and that a medical man who had read up the subject. I cannot honestly estimate how often I have used the 20 per cent. solution of cocaine in vesico-urethral practice, but the actual number of applications must be very great. I obtained the drug directly after its introduction in 1884, and have used it freely in lithotrity, internal urethrotomy, dilatation of stricture, and other operations on the bladder and urethra. Over 300 vesico-urethral cases attend my out-patient department at St. Peter's Hospital every week, and cocaine is and has been used routinely since January, 1885. I believe the apprehension of dangerous symptoms following its use upon the urethra to be quite unfounded.

capillaries would render the mucous membranes bloodless or less congested than they otherwise would appear, and so mislead the surgeon, who is greatly guided by the aspect of the vascularity. Secondly, in painful or neuralgic urethra, where the patient can localise the site of the pain or discomfort, it might be supposed, as all sensation is in abeyance after the cocaine application, that the surgeon would be without a trustworthy guide to the position of the diseased patch. The former objection is more theoretical than practical. It is an open question if the application of cocaine does constrict the vessels of the urethral mucous membrane to any marked degree. Even if this is the case, and I doubt it, the slight change in the visual field cannot outweigh the moral influence of a promised painless examination, or the opportunity such must afford for a searching and prolonged urethroscopy.

Again, the objection to the use of cocaine as inducing a loss of localising power is certainly a valid one. It can, however, be easily overcome by marking with an aniline pencil on the outside of the penis or the perinæum the spot which is indicated by the patient as the site of the pain. Even this is seldom necessary, for with practice

the eye gets accustomed to any deviation from the normal, and proves frequently a more trustworthy guide than even the patient's sensations.

The application of the cocaine is simple enough. Suck up into a medicine dropper fifteen to twenty drops of a 4—20 per cent. solution of cocaine and inject the same into the urethra. Pass the fingers of the left hand gently along the under surface of the penis, whilst the glans is being laterally compressed by the fingers of the right, so as to drive the injection deep into the canal. There is no necessity to wait for a perfect anæsthetic condition to develop if a 20 per cent. solution has been used, for the cannula can be immediately passed without pain to the hilt, a drop or two of glycerine sufficing to lubricate its surface. If an obstruction is met with : stop at once, withdraw the plug, affix the lantern, and examine what the obstruction be due to, whether it be stricture, granulation, or growth. The greatest gentleness is necessary, for if the vessels be engorged a slight violence may rupture them, and the consequent bleeding will prove troublesome in obscuring the view. If no obstruction is encountered : pass the cannula to the hilt, withdraw the plug gently,—for a sudden and brusque movement may jerk the end of the canal

against the wall and produce bleeding, fit in the lantern, and examine the mucous membrane as the cannula is being slowly withdrawn. If the cannulæ are marked in inches a note of the exact position of the diseased mucous membrane can be made for future reference. Frequently a drop of mucus, gleet, or the lubricant will obscure the surface of the mucous membrane; a pledget of cotton-wool on a stylet removes it, hence it is wise to use as little glycerine as possible. Should the wool slip off the end of the stylet it will be passed on urination or may be removed by a hook-ended stylet applied through the cannula.*

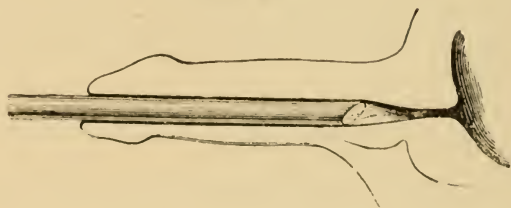
Capabilities.—The illuminating power is very considerable. Every section of the urethra can be thoroughly examined, piece by piece, and every detail of its surface as easily studied as if the canal were exposed to direct sunlight. The openings of the lacunæ are readily recognised, and it is said that with appropriate elbowed cannulæ the prostatic urethra and its caput gallinaginis and openings for the prostatic sinuses can be distinguished.

* In dealing with tight stricture it must be remembered that the stream of urine will barely suffice to eject the pledget, and that in these cases it becomes absolutely necessary to recover it with the hooked stylet.

I have not had occasion to examine the prostatic urethra, but if this be so the urethroscope may throw some light upon the cause, and control the present empirical treatment of profuse seminal emissions.

Fig. 44 shows the light from the end of the tube upon the adjoining surface of the urethra, but the sketch is only diagrammatic. The urethra closes

FIG. 44.



in over the end of the cannula in the form of a cone, funnel, or circle of mucous membrane with a depressed centre. It is upon this funnel that the observer's eye is fixed, and it is upon the appearances of its component parts, viz. (*a*) the rim, (*b*) the central figure (Grünfeld) or depressed centre, and (*c*) the intervening surface, that the diagnosis of health or disease depends.

The form and shape of the funnel varies. This is partly owing to the pressure of the end of the cannula, but it is greatly dependent upon the

character of the mucosa. If the mucosa be healthy and pliant it will yield and fall over the end of the cannula. If its natural elasticity be replaced by the stiffness of inflammatory exudation or the induration of cicatricial contraction, the funnel lengthens, and the alteration in shape is readily recognised.

(a) The rim or edge of the funnel generally appears white from the pressure of the rim of the cannula.

(b) The central figure is of a very variable shape, it may be a mere linear transverse crack, a dimple or an oval slit. It is usually obscured by a drop of fluid and needs well cleansing. Radiating from the centre in (c) the intermediate part, are a number of fine folds, the thickness of which affords us a certain knowledge of the condition of the mucosa, whether it be infiltrated or not. The surface, if the urethra be normal, is smooth, glistening, and of a yellowish-red colour. It is covered with innumerable small vessels, some obviously arterial, others venous in character. The direction of their course is, for the most part, along the long axis of the canal.

USES.

Gleet.—Few practitioners will agree with Dr. Oberländer in his belief that a gonorrhœa cannot be thoroughly cured without an endoscope, and yet many will readily admit that in intractable cases of gleet, a searching visual examination of the diseased surface would be of the greatest advantage. For not only might the cause for the chronicity be revealed, but a more efficient and less empirical form of local treatment could be adopted to arrest the discharge. The urethroscope has never been a popular instrument, and I believe it is due to this fact that so many of the old-standing neglected gleans lapse into a stricture which might have been avoided. From the earliest days of endoscopy we have been made familiar with a variety of morbid conditions of the urethra which produce a discharge or gleet. Thus we have urethritis granulosa (described by Desormeaux); urethritis membranacea; urethritis hæmorrhagica; urethritis glandularis; urethritis squamosa; urethritis simplex, &c.

It has been contended that these divisions are artificial, and the outcome of mistaken diagnosis from insufficient illumination. It will be for the

incandescent-lamp urethroscope to clear up definitely these contradictory statements. After having used the instrument upon a very large number of gleet^y urethræ, I cannot help feeling that the above nomenclature is unnecessary. For the most part, the urethræ of patients who have suffered from a gleet^y discharge for years might be called "sweaty." The surface is moist, and when cleaned with the stylet pledget appears dull, as if the epithelial layer had desquamated and become thinner. The vessels are full and congested, sometimes purplish; the whole mucous membrane appears "toneless." The elasticity, judged by the flexibility of the "funnel," does not generally seem impaired. This class does well under Thallin bougies, and astringent injections.*

This purplish, "toneless" condition was especially well marked in a case in which the gleet had lasted seven years. I showed the patient at the Medical Society (January 23rd), and demonstrated the congested condition with the incandescent-lamp urethroscope, contrasting with it normal and strictured urethræ.† This gleet was

* Author, "The Use of the Antrophores or Spring Bougies in Eighty Cases of Chronic Gleet," 'Lancet,' April 14th, 1888.

† Author, 'British Medical Journal,' March 2nd, 1888.

rapidly dried up by means of Thallin bougies, and for some days I congratulated myself at the success attendant on their use. The gleet relapsed, however, on their discontinuance. The urethra admitted a No. 14, English.

A congested condition of the *entire* urethra is seen in some cases of morbus cordis, apparently giving rise to no discomfort or discharge, unless a urethritis has been contracted. The gleet is then very difficult to cure.

Urethritis granulosa.—This is, in my experience, a rare disease of the urethra, but a more extensive series of electric endoscopic examinations may show this belief to be incorrect. It has been said that such a condition *never* exists, but that the appearance of “granulations” is due to awkward manipulation of the cannula, producing badly-illuminated local congestions. This contention cannot be maintained with the improved method of lighting, and some cases will show the granular condition of the mucous membrane most clearly. The disease is generally seen as a little patch or patches of granulation-like projections, which are small in size and numerous. They are often deeply congested, and bleed at the slightest touch. The surrounding mucous membrane is thickened (suc-

culent). Nothing short of local and careful application, such as that of powdered lead acetate, caustics, or the galvano-cautery, has any effect. The following case, which my friend and colleague Mr. Swinford Edwards brought me to examine, is a good example.

CASE 69.—J. K., æt. 23, had suffered pain in the urethra, at one and a half inches from the meatus, for eighteen months. He has been treated with a great number of drugs, including Soda Salicylate, gr. xx, thrice a day; Potassium Bromide and Valerian. The porte-caustique had been applied to the painful spot, after which he felt some relief, but the pain returned. Electric illumination of the urethra was therefore decided upon.

On introducing the urethroscope after cocainisation, a granular condition very similar to that found in the palpebral conjunctiva was immediately discovered. The "granulations" were unusually large and firm, and deeply injected; a few dabs with the stylet pad soaked in nitrate of silver (gr. xx ad ʒj) turned the vivid red to a milk white. Next day the patient was much easier, and for a week his pain greatly decreased. It returned, however, in a lesser degree and needed, as these cases nearly always do, a few reapplications of the caustic.

It is this lumpy, readily-bleeding surface which deceives the ill-educated, unskilled hand whilst passing a bougie. A stricture is diagnosed from the bleeding. Constant irritation is, thereupon, induced by the passage of bougies to overcome a contraction which never existed, and a localised, morbid condition is increased which, if treated properly and in time, would have subsided.

Urethral Neuralgia.—The value of the urethral endoscope will be most apparent in the diagnosis and treatment of cases of persistent urethral neuralgia, one of the causes of which has just been stated to be a granular condition. The apparent change most often found in the urethral mucous membrane at the spot where the continual discomfort or pain is complained of is a dark or congested patch of slightly swollen mucous membrane. There may be no swelling at all, merely a flush of injection. When this is cauterised with direct application of a solution of nitrate of silver of appropriate strength, the pain will greatly diminish and the urethra will resume a more normal appearance. It is remarkable how these neuralgic urethræ affect the patient. Their obstinate continuance has a most depressing effect, even upon sensible men. It is a question whether the pain, said to be experienced in the urethra, is not the index of some demoralisation of the nervous system, for a history of onanism, excessive sexual intercourse, or of inherited cerebral taint may sometimes be elicited in these cases. There is also another very striking feature: neuralgia of other parts besides the urethra is frequently complained of, and the pain experienced seems to depend for its

origin and acuteness upon the urethral condition. The following cases will serve to illustrate this extended sympathy with the urethra as well as the benefit derived from their local treatment.

CASE 70.—A gentleman came to me from Servia complaining of constant pain in his face, limbs, and urethra. The urethral pain had existed for five years, and was consequent upon an attack of gonorrhœa. The patient was a well-built, athletic man of forty; he had had several severe attacks of malaria. His knee-jerks were excessive. He suffered from pin-and-needle sensations in his limbs which he described as “feeling like small grains of glass fixed in his muscles.” He had lost all sexual power and had a frequent desire to vomit; his pupils were unequal. There was no swaying gait and no residual urine. Believing that his nervous system was thoroughly demoralised by malaria, and that under these circumstances an urethral granulation might have induced and augmented the continual neuralgias of which he complained, I proceeded to pass the old-fashioned endoscope to examine his urethra; before doing so I applied in the ordinary routine fashion a few drops of a 20 per-cent. solution of cocaine to his urethra. In about sixty seconds he exclaimed that the neuralgia in his face was leaving him, and in two minutes he was completely free from the pain in his face, limbs, and urethra, which he assured me had been so constant as to cause him to throw up an important and lucrative official position. I found a very sensitive spot two and a half inches from the meatus (granulation patch?), and cauterised it lightly on two occasions. He got rapidly well and returned, I believe, to Servia, in anticipation of the approaching war.*

CASE 71.—T. B., æt. 39, married, has suffered pain in his urethra just behind his glans penis for seven months. He feels it most when at work. He has no stricture, stone, or prostatic

* Author, “A Novel Extension of the Use of Cocaine,” Medical Society’s Trans., 1888.

trouble. Nothing seemed to relieve him. He began gradually to complain of pain in the thighs and groins, also in the ankles and down the tibiæ. Week after week he attended the out-patient department with the same tale. Antipyrin in five-grain doses relieved for a few days but the pain returned. A congested patch about two inches down the urethra was seen by means of the electric urethroscope. I could hardly believe so apparently trifling a condition could set up so much neuralgic disturbance, but I soon found my mistake. I lightly cauterised the spot with a solution of nitrate of silver (gr. v ad 3j) with immediate relief, not only from the urethral pain but also the leg and thigh discomfort. I repeated the application several succeeding weeks with excellent and, I believe, permanent result.

Another well-marked case was relieved of an obstinate groin pain, apparently produced by a localised congested patch in the penile urethra.* There are two positions affected by these painful

* The widespread nervous connections with the urethral mucous membrane is a well-recognised fact. A proof, if such were needed, can be established by the application of cocaine to the urethra upon the principle of its reflex inhibitory power, a subject which I have lately brought before the profession. ("A Novel Extension of the Uses of Cocaine," 'Med. Soc. Trans.,' 1888, from the manuscript of which communication Case 1 has been excerpted.) The following case is a better example. It is very similar to one recorded by Sir Benjamin Brodie of a stricture which induced lameness and pain in the foot, the symptoms being promptly removed by the use of the bougie:

W. S.—, æt. 38, married, nine children, came complaining that he has been "suffering" (*i. e.* worried?) from a burning pain in the glans penis and legs for seven years. No syphilis, ataxia, malaria, or vesico-urethral disease. Some relief was obtained from a mixture of bromide of potassium and valerian. I then lost sight of him for some months. One day he appeared, limping with evident pain, and stated that for three months the

patches. One anterior, a little way behind the glans, and the other posterior, at the entrance to the membranous urethra.

Ulcerations.—Definite ulcers of the mucous membrane are said to exist in the acutest form of gonorrhœa. They occur, also, behind strictures, and are, moreover, produced by impaction of stones. In urethral pain I have seen them sometimes at two inches from the meatus.

Herpes.—Herpetic patches are said to be found in those who are liable to herpes of the glans and prepuce. I have not yet met with a case. They are as transient as the disease.

Syphilis.—Syphilitic roseola undoubtedly exists, and is not infrequently evidenced by a sudden urethral discharge coincident with the onset of the secondary symptoms. Chancres have been recorded in the penile urethra.

Impacted Stone.—Small renal calculi or fragments of a vesical concretion, fractured sponta-

neously, had increased. "Sometimes," said he, "it is the left leg, sometimes the right, sometimes both, and to-day it is both, and I cannot walk without hobbling, and I get no relief from anything. I injected 30 minims of a 20 per-cent. solution of cocaine into his urethra. In twenty seconds he could press his feet flat on the floor, and in ninety seconds he was running lightly up and down the room. The relief continued for some hours.

neously or by the lithotrite, are sometimes arrested in the urethral canal. They can usually be pressed back into the bladder, and subsequently removed by the aspirator and evacuating catheter, or crushed and evacuated by litholapaxy. Now and again these little stones become impacted in the urethral wall, which rapidly swells and partially covers them, rendering it most difficult to push them back or pull them forward with the forceps. By passing an endoscopic cannula up to the stone, the body can be so manipulated out of its pit with a fine wire or stylet working in the light, that its removal becomes possible.

Foreign Bodies.—The same remark applies to foreign bodies. The light proving a most efficient guide to the forceps in the extraction of the same.

Pouches.—Such rare and obscure conditions as pouches of the urethra can be investigated by means of the urethroscope, but without much practical value.*

Tumours.—The urethroscope has proved of great value in the diagnosis and treatment of these very rare affections. As a primary affection they are only met with in the fibrous (polypoid or

* Author, "Pouch of Penile Urethra which had contained Seven Small Facetted Stones and One Large Irregular Calculus," 'Med. Soc. Proc.,' 1887, p. 32.

papillary) and the vascular forms. The female is more affected, but the male is not exempt. Thus I was able by means of a very short tube to find a collection of small warts, evidently of gonorrhœal origin, situated in the male canal not far from the urinary meatus. They had kept up a discharge which had been treated for long by various medical men with balsams and injections. Local application soon removed them. Gross* gives two similar cases.

Dr. Ebermann† has an ingenious method of removing these and other urethral growths. This consists in introducing an endoscopic tube, the end of which is closed, but its side is furnished with a large oval eye. The polypus or growth is first entangled in this eye, and a second tube, the

* Gross, 'Diseases of the Urinary Organs,' p. 530, 1876, 3rd edit.; compare Roger, 'Gazette Hebdom.,' No. 32, 1860, p. 555. In a very remarkable case recorded by Roger the vegetations which formed dendritic club-shaped villosities, from the size of a pin's head to that of a pea, reached from the bulb to the meatus, greatly distending the urethra, which measured two inches and two fifths in circumference at the level of the bulb. The walls of the canal were greatly thickened and indurated. The patient had always suffered from dysuria, which amounted to retention for twenty-four hours before death from phthisis. The enlarged and lengthened penis was always in a state of semi-erection.

† Ebermann, 'St. Petersburger Medicin Zeitschrift,' Bd. 8, 1865, p. 252.

extremity of which is open and sharp, is passed into the former, and the polypus cut off. On withdrawing the latter tube the wound is cauterized with nitrate of silver.

Grünfeld* mentions that he has seen eight cases, on five of which he has operated. They were all seen with the old-fashioned urethroscope.

A waiter, æt. 25, who had previously suffered from a urethritis and meatal condylomata for eighteen months, came under Dr. Grünfeld with a recurrence of the discharge. On passing the cannula a polypus of the urethra was discovered 6.2 cm. from the orifice. It was attached to the right upper wall. Anterior to its site, the urethra was in a state of acute inflammation. The polypus was removed with the polypus forceps, and its base of attachment touched with caustic.

Patient, æt. 29, passing urethral blood, was examined and a polypus 13 mm. across and 25 mm. long, was discovered with the urethroscope, and removed by means of the snare.

Stricture.—I now approach the subject of the diagnosis and treatment of stricture by means of the electric light. The stricture itself is easily

* Grünfeld, "Das Harnröhrenspiegel," 'Wiener Klinik,' 1877, pp. 94 and 95.

recognisable, for on pressing the cannula against a narrow stricture, the end of the tube is seen blocked by a yellowish-white or whitish substance. Nothing but an irregular wall of this material can be seen. On withdrawing the cannula slightly and relieving the face of the stricture from the pressure of the end of the instrument the central figure will become visible. It is represented generally as a fine vertical crack, or a dark, shadowy point, placed, may be, excentrically, having perhaps a drop of mucus upon it. Into this crack or depression a fine bougie may be guided by the eye, and passed through the stricture.

In *commencing* stricture the appearance of the funnel is a very characteristic one. Part or all of the circumference of the urethral mucous membrane is transformed into a small condensed plate, which does not roll, in the normal fashion, into the end of the cannula as it is withdrawn, but which abruptly closes over it like a trap-door. Its colour is much whiter than the adjoining normal mucous membrane. The central figure of the funnel is not always readily found and needs a little manipulation to bring it into view.

But, given, that a stricture is seen, and that its opening can readily be engaged by the bougie

guided thereto by the eye, is the method of any practical value? Rarely.

It is certain that with so simple and practical an urethroscope as Leiter's, and with a greater visual knowledge of urethral diseases, that we shall have fewer false diagnoses of stricture, and therefore fewer instances of normal urethræ "worried into stricture" by unnecessary and harmful instrumentation. But it is equally apparent to any medical man accustomed to frequent manipulations of urethral bougies that delicacy of touch is of much greater value and importance in the *practical* and successful treatment of stricture than the electric light.

Moreover, strictures are nearly half as often multiple as single. Thus, taking two of my outpatient attendances at St. Peter's Hospital, as these pages were being revised (April 21st and 23rd, 1888), as being a rough average, 38 cases of stricture attended, and of these 16 were shown to have multiple constrictions.

In statistics of 550 cases of organic stricture of the urethra which had been under my care and of which careful notes had been taken, the proportion of single to multiple strictures was nearly 2 to 1.

In those strictures noted as “multiple”—

2 strictures co-existed in 112 cases (76 per cent.)			
3	„	28	„ (5·4 per cent.)
4	„	8	„
5	„	2	„
7	„	1	„

An urethrosopic cannula would demonstrate the opening of the most anterior of these strictures, but the orifices of those more posteriorly placed would have to be engaged by the bougie, guided by the sense of touch.

In false passages.—The instrument may possibly be of use in false passages made by rough and unskilful instrumentation.

CASE 72.—H. C—, æt. 36, had suffered from stricture for some time. He states that he was seized with a sudden retention, for the relief of which a surgeon passed a silver catheter of the smallest size nearly up to the hilt (?), but no urine came through the instrument. He was relieved by a hot bath. He applied to me for treatment, and I attempted to introduce a black elastic bougie, but the instrument always slipped into the wrong track, which commenced at the triangular ligament just in front of the stricture. On passing the endoscope two orifices were seen: an excentrically placed orifice leading to the bladder, and a second excentrically blood-edged slit, the opening apparently of the false passage. The stricture admitted a No. 6 French without gripping, and the bladder was readily reached.

In such cases as these the instrument may be of some value.

APPENDIX.

THE EVOLUTION OF THE INCANDESCENCE SYSTEM.*

Edison's and Swan's incandescence systems were announced practically at the same time.

Edison's first patent incandescent lamp (dated June 17th, 1879) related to the combination of a sealed vacuum chamber, made of a glass vessel, with a continuous incandescent conductor of metal such as platinum, carried on an infusible bobbin.

In the second patent (dated November 10th, 1879), the intention of using a carbon wire in an exhausted bulb for incandescence is proclaimed. After referring to the practice, which had been followed up to that date (by Konn and others) of using relatively large rods of carbon in closed vessels containing gases that do not combine with the carbon, such rods having a relatively low resistance, Mr. Edison proceeds as follows: "I have reversed this practice; I have discovered that even a cotton thread properly carbonised, and placed in a sealed glass bulb, exhausted to one millionth of an atmosphere, offers from 100 to 500 ohms resistance to the passage of the current, and that it is absolutely stable at a very high temperature; that if the thread be coiled as a spiral and carbonised, or if any fibrous vegetable substance, which will leave a carbon residue after heating in a closed chamber, be so

* This note has been added to supply information about the lamps to those interested in their construction. Many questions have been asked me concerning them which have shown me that some confusion exists as to the history of the invention.

coiled, that as much as 2000 ohms resistance may be obtained without presenting a radiating surface of more than $\frac{3}{16}$ ths of an inch; that if such fibrous material be rubbed with a plastic compound composed of lamp-black and tar, its resistance may be made high or low according to the amount of lamp-black placed upon it." Edison had at that time experimented with carbonised "cotton and linen thread, wood splints, paper coiled in various ways, also lamp-black, plumbago, and carbon in various forms." Cotton thread, it will be observed, had been tried by Edison, but it had not occurred to him to convert the thread, before carbonising, into a new material by sulphuric acid, as Mr. Swan did a few months afterwards, thus creating an efficient and thoroughly reliable filament.

The fourth patent (dated September 16th, 1880) is still nearer the final evolution of the little lamps we use in the cystoscope. The specification of this patent, which is very voluminous, is interesting and important, as it describes in great detail the mode of preparing the carbon filaments, and the physical properties which, according to Edison, are necessary in the carbons to produce efficient lighting. For incandescent lamps, Mr. Edison states that he discovered that the filament should have the highest possible resistance in a very small bulk, and be capable of resisting the disintegrating effects of great heats, and the absence of atmospheric pressure, and further, that carbons which are purely structural in character alone possess these qualities.

By purely structural is meant a carbon wherein the natural structure, cellular or otherwise, of the original material is preserved unaltered, that is, not modified by any treatment which tends to fill up the cells or pores with unstructural carbon, or to increase its density or to alter its resistance.

The preferable single fibres are those of which jute, bast, manilla, hemp, &c., are good types, the more preferable one being a fibrous grass from South America called "Monkey Bast" fibre, each blade of which is generally round and composed of a great number of elementary fibres held together by a natural cement or resin, which, carbonising, locks all the elementary fibres together into a homogeneous filament.

In this patent the use of cane and bamboo as a suitable material for carbon is mentioned. Thus the cane is split into pieces somewhat wider than necessary, and the inner or pith* portion removed. It is then cut into strips, which are passed through a shaving tool, in which the knife is fixed, the material being forced against it by a movable block provided with an adjustable stop-screw, by which the distance of the block from the knife can be regulated to adjust the thickness to be given to the slip. The slip is thus shaved on both sides until the proper thickness is attained. It is then placed in a clamp made in two halves, of a length equal to the desired length of the slip. In one half a shoulder or offset is formed at a distance from the edge greater than the desired width, upon which one edge of the fibre rests, which is then clamped between the two halves, and the protruding portion carefully shaved off, which may be done by hand or by a cutting blade moved by machinery. On the opposite side of the clamps is an offset in one half, at a distance from the edge exactly equal to the width to be given the slip. Upon the same side of the clamps and at the ends, projections are made of the exact shape and size to be given to the broadened ends of the carbons. The slip, shaved upon both sides and one edge, is transferred to the opening in the clamps, and the extra material shaved or cut off.

It is now of uniform size throughout its body, with enlarged ends (the widening is only on one edge) formed upon it. Detailed descriptions are given of modes of carbonisation, which may be summarised as follows:—A metal (preferably nickel) flask is employed, in the bottom of which is cut a groove of a curved or horseshoe form, which the filament is ultimately to receive; the filament is placed within this groove, and a relatively heavy metal cover is laid upon it in the flask, the upper face of the cover having a similar groove cut in it to receive a second filament, over which a similar cover is placed, and so on, until the flask is full, and a considerable number of filaments are ready for carbonisation. The flask so filled is placed in an oven and subjected to an intense heat, produced by gas fuel and a suitable blast directed upon the flask. In some cases it is stated to be found

desirable to maintain an atmosphere of hydrogen, "or some hydro-carbon," within the flask during carbonisation to prevent excessive oxidation of the filaments.

When the moulds are opened, the filaments are in a condition to be electro-plated to their platinum supports and introduced into their lamp-bulbs, but yet another process is required to confer upon them their perfectly homogeneous and elastic character, as well as their refractory nature at high degrees of incandescence, which are such essential characteristics in an incandescent lamp. This further process is applied when the lamp is attached to the pump, and while exhaustion is going on; it consists in alternately heating and cooling the filament in the Sprengel-Vacuum by passing currents of electricity through it of increasing strength until high degrees of incandescence are reached, and between each increase of current allowing it to cool down, exhaustion going on all the time. By this process, not only are the occluded gases eliminated, but as the fibre is subjected to a far more severe test than it can ever be subjected to in working, none but "the fittest" survive, and a healthy generation of lamps is insured.

Swan.

The first published notice of the Swan incandescence lamp appeared in the issue of the 'Photographic Journal,' for June, 1880, but Mr. Swan had publicly exhibited a carbon filament lamp, which gave excellent results, twelve months before the above-named date, at the conclusion of a lecture he delivered in Newcastle, Sir William Armstrong presiding. Mr. Swan had ultimately adopted cotton thread, which is susceptible to the parchmmentizing operation that had enabled him to obtain such promising results with paper prepared in the same manner. Steeping cotton in a solution of sulphuric acid and water until the tissue is destroyed produces, when properly washed and dried, a horny homogeneous filament of a very considerable strength. To increase the density and uniformity of the filament thus

obtained it is passed between compressing rollers and flattened so that a somewhat increased area of incandescent surface is thus obtained.

It was on the 17th of June, 1879, that Edison took out his patent in this country for the manufacture of incandescence electric lamps with prepared platinum or alloyed platinum luminous loops, but, like the inventors twenty years before him, quickly abandoned metallic and availed himself of vegetable filaments. Mr. Swan, on the other hand, had worked with the latter from the beginning, and the evolution of his system, from the first imperfect and rapidly failing horseshoe of carbonised paper, to his permanent metal-like filament of carbonised thread, is interesting but foreign to our subject. Those of our readers who wish for further information cannot do better than consult Dredge's 'Electric Illumination,' vol. i, 1882, from the able and exhaustive pages of which I have collated the preceding.

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